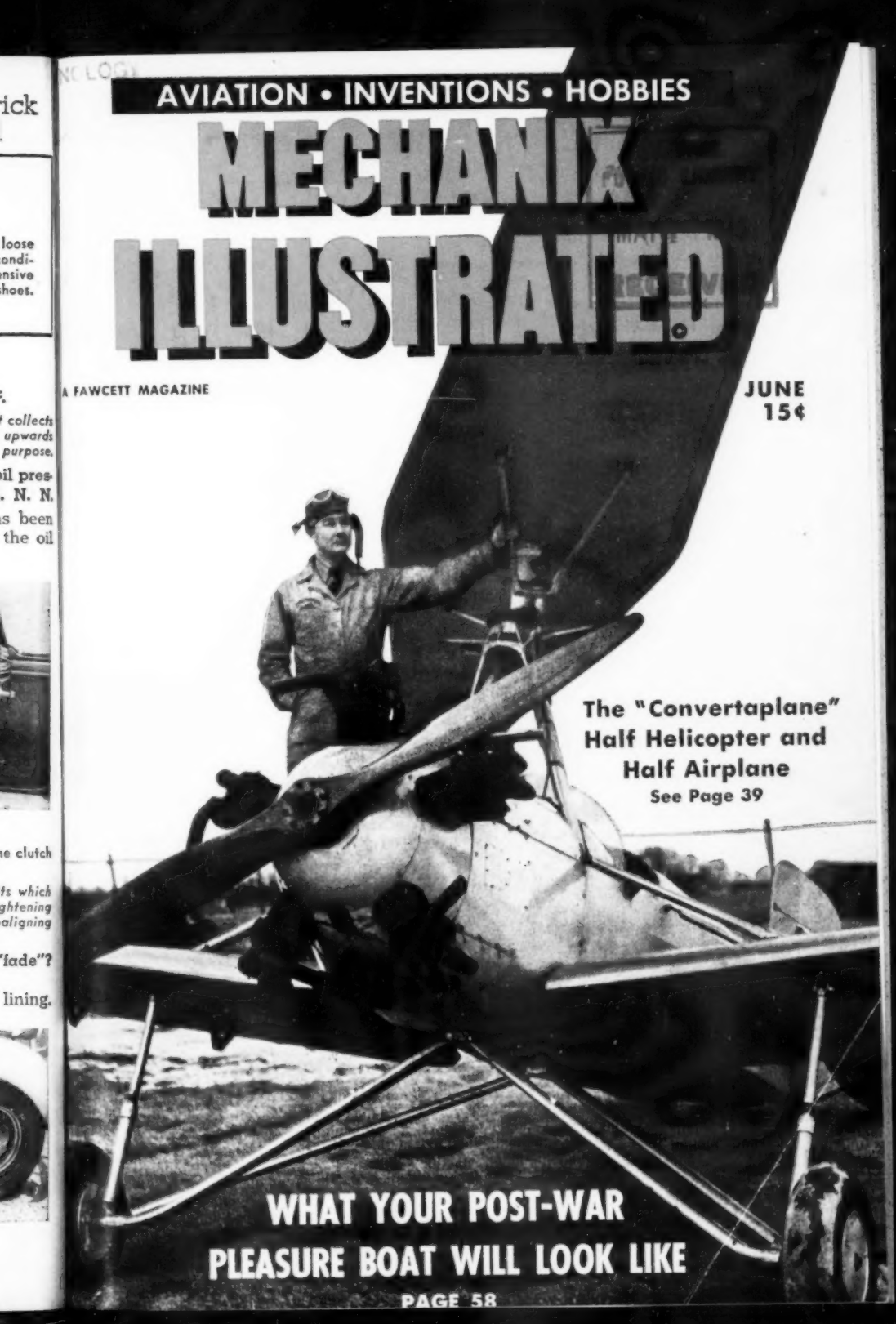
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VOL. XXX NO. 2

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## SPECIAL FEATURES

*On the Cover: The first published Kodachrome of Gerard Herrick's Convertaplane, the amazing new aircraft which is considered by many the leading contender for the title of Family Plane of the Future. For its inventor's story about the Convertaplane, see page 39. Kodachrome by Norman C. Lipton.*

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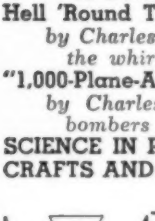
Are you planning to take a vacation this year? If you are, you're probably worried about obstacles like gas rationing and the rubber shortage, and may feel that you'll have to stay somewhere pretty close to home. But you don't! In next month's MECHANIX ILLUSTRATED you'll find complete information on the most interesting and unusual vacation trip you ever heard of—the kind of trip you've always dreamed of making some day. And you don't need an automobile for it at all! So before you settle the plans for your vacation this year be sure to read You Can Go Canoe-Camping in the July MECHANIX ILLUSTRATED.

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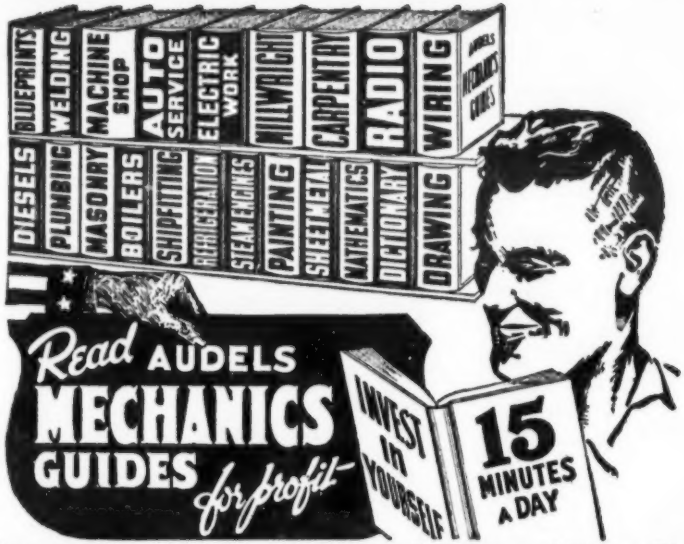


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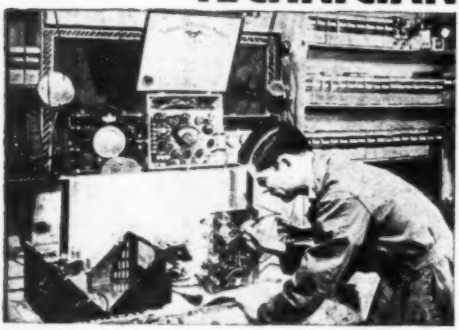

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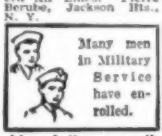

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# She SAID: I'm sorry I can't go with you tonight..

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—Charles Atlas

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# YOUR INVENTION CLINIC

Conducted by
JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

## Radio Switching Mechanism

Bruce Mason, Atoka, Okla., states that he has a device which will turn on a radio set automatically when a signal is transmitted from a broadcasting station. He believes that this will be particularly serviceable for police cars which could leave their radios turned off. The sets would be turned on again automatically directly from the transmitter. He wants our opinion.

ANSWER: *Many inventors have been working upon this idea. Some of them have designed equipment which permits a police station to single out one from all other patrol cars and transmit a message to that car only. However, the mechanisms which we have seen so far are extremely delicate and sensitive. They are not particularly suitable for the rough treatment to which they would be put.*

*If the mechanism you have designed is rugged, simple and economical it would be of great value not only to police but also for use on tanks, ships, planes and for air raid wardens and home radio sets which could be turned on automatically from a transmitter in the event of an alert or for important announcements.*

*We believe that the general scheme is most valuable indeed and would recommend that you proceed further on condition that the equipment will do what you claim for it. You do not include details of the mechanism and consequently we cannot be more specific.*

*Maybe your idea differs in some details from some of the mechanisms which have appeared or been patented. On the other hand, your design may be much inferior to them. We can give you no further advice without complete specifications.*

## Variable Speed Gear

William Wilson, Cincinnati, Ohio, submits a design for a variable speed gear which permits of speed changes from neutral to top speed by the operation of only one lever.

In accordance with our established policy of not disclosing the details of any item we believe holds promise, the details of this mechanism are not printed here.

ANSWER: *We would recommend that you have a patent search made on this variable speed gear immediately. We do not agree that such a mechanism will find use in the automobile of the future. We believe that other forms of drive probably will be substituted for gears. Nevertheless, there are many other motor-driven devices which would be benefited by the use of a gear mechanism similar to your design.*

*Before you apply for a patent, we would recommend that you build a model of this unit and eliminate the "bugs" which we feel sure you will find in developing this mechanism. The worst one will be in maintaining a point of neutrality and insuring perfect meshing of the gears as the lever is manipulated.*

## Rotary Gasoline Engine

Othalen M. Stevens, Belle, W. Va., says that he has completed a design for a gasoline engine which eliminates connecting rod and crank shaft and in which the piston travels through a 360-degree circle. He asks us whether we think this idea is valuable.

ANSWER: *Again we must advise that unless sufficiently clear illustrations accompany a suggestion it is impossible to comment specifically. Rotary gasoline engines have been designed. Gasoline engines without crank shafts in which the piston travels through a 360-degree circle have been demonstrated and manufactured commercially.*

## Toothpaste Dispenser

Frank W. Boal, New Castle, Pa., writes: "You say that a practical, molded toothpaste dispenser would find a ready market (MECHANIX ILLUSTRATED, February, 1943). I have had such a device in mind for the past two years but thought it was just a brain storm. Your comment inspired me to submit these plans for an opinion."

Then follows a description which is made clear in the reply.

ANSWER: *Your design of a toothpaste dispenser falls far from the mark. You make it necessary to screw a new toothpaste tube into the fitting at the bottom of the dispenser. Then, the operator*

[Continued on page 152]

# INVENTORS AMERICA NEEDS YOUR IDEAS

## *In War and in Peace*

**Your country—in fact the whole civilized world—is in crying need of new ideas—these new ideas, YOUR IDEAS, must lead not only to victory in war but to prosperity in the peace which will inevitably follow. TIME MARCHES ON—today's inventions are tomorrow's craftsmanship, and post-war prosperity and readjustment will demand the creation of thousands of simple things that will win recognition—perhaps wealth—for you. TIME MARCHES ON and you march with it—or it passes you by.**

## *Peace Is Coming*

Factories now converted to War Production for the duration are already buying new inventions. They must take up NEW IDEAS in order to continue in business when the war ends. That's the time when new improved articles will be rushed onto the market and the lucky patent holders will reap the profits.

## NOW IS THE TIME TO PATENT YOUR INVENTION

No matter who you are, where you are —no matter what your invention is, NOW is the time to apply for a patent. By delaying you may not only lose your rights, but you may miss some immediate opportunity of making money. When a house is burning down, it's too late to get fire insurance. When a market already exists for your invention, then it may be too late for you to apply for a patent.

## A PATENT NOW MEANS POST WAR PROFITS

Remember that you can sell your patent rights now, regardless whether or not your invention can be made and marketed for the duration, because manufacturers are buying patents today in order to have new merchandise on the market as soon as priority restrictions are removed. Remember, too, a Patent is good for 17 years. So get the FACTS by writing for our free "Patent Guide". Be safe—not sorry!

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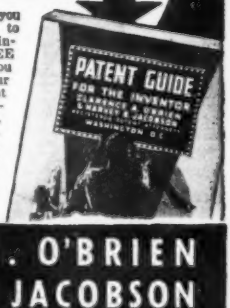


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# CHIPS *from the* EDITOR'S WORKBENCH

### *Turnabout*

FOR years MI has been awarding Editor's Workbench Certificates of Merit, along with cash prizes, to readers whose handiwork was worthy of encouragement by reason of its excellence. During all this time the award traffic was strictly one-way, that is, nobody ever gave *us* anything.

We're happy and proud to report that we've finally been appreciated, and by none other than the United States Navy. The Navy has presented us with the Award of Merit which you see reproduced below. It came as a complete surprise, because we had thought of our co-operation in various ways with the Navy as merely an enjoyable duty to our country in time of need, with no idea of reward or particular recognition. We want to thank the Navy Department and Admiral Moreell, and ask them and our readers to forgive us if we seem to be strutting a bit. Under the circumstances, it's only natural. While we think of it, if any of you would like to see the original certificate just drop up to our offices in the Paramount Building, New York City. We'll be proud to show it to you.

### *Contest*

AS THIS is written, entries are still pouring in for our Buildwords contest. When the last entries are received, the judges will go to work to pick the winner of that Aeronca Defender Trainer airplane—or the $1,500.00 in War Bonds. Since we extended the deadline for entries an additional 15 days this year, because of the difficulty of getting magazines on sale at newsstands on time, announcement of the prizewinners probably will be made somewhat later than usual this year. We will make a sincere effort to announce the prizewinners in our next issue—

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# Editor's Workbench Chips

but we cannot promise that the judging will be completed in time for the deadline of that issue.

### *Ticket To Tomorrow*

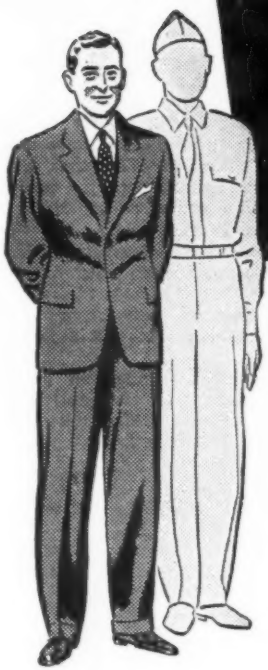
BECAUSE of the paper shortage, fewer copies of MECHANIX ILLUSTRATED are being printed Because of transportation difficulties, MI is appearing on the newsstands late, in many cases, each month. As a result of these wartime upsets, many of our readers are unable to buy copies of MI. If you don't want to be disappointed, we would like to suggest that you take advantage of MI's bargain subscription offer. For $1.50 you can get a year's subscription to MI and the postman will deliver your copy to you each month. On page 149 you will find a handy coupon to fill out. Turn to it now and send it along with your $1.50, to the Fawcett Bldg., Greenwich, Conn. You'll find your subscription coupon is a "ticket to tomorrow"—a pass that will enable you to read about and see the scientific wonders of the future, as they are pictured each month in MI.

### *Bazooka*

ROCKET guns are now being used by the U. S. Army. Thus the Army is rapidly catching up with Captain Midnight, Buck Rogers and

MEOW!

Mr. J. A. Tomlinson, 43-43 91st Place, Elmhurst, L. I., N. Y., built this Meow from plans in HOW TO BUILD 20 BOATS. It's a good job, and it brings Mr. Tomlinson a $3.00 Workbench award and a Certificate of Merit.



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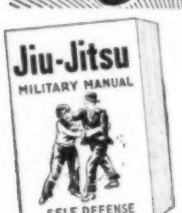


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## Editor's Workbench Chips

other comic strip heroes who have been using rocket guns and ray guns for years—on paper. Major Gen. L. H. Campbell, Jr., chief of ordnance for the U. S. Army, announced the fact that the rocket gun is now in action against the enemy.

Because the new gun is said to look like Bob Burns' plumbing trombone—made out of a length of pipe—it is called the "bazooka."

Gen. Campbell declared the weapon makes the soldier using it "the master of any tank which may attack him," and asserts that the projectile it fires will penetrate armor, smash through brick and rock walls, shatter bridges and "perform other seeming miracles." General Campbell told of a battle in North Africa in which an American soldier fired his "bazooka" at a formation of six tanks. The shell missed the tanks, but hit a large tree near one of them and blew it into a thousand splinters.

"The Nazi tank commander, an experienced officer, surrendered," Gen. Campbell said. "The Americans were astonished. The tank commander explained, 'when you start firing 155-mm. guns at our tanks, it's time to surrender.'"

The Nazi had confused the gun's projectile with a shell which is approximately the diameter of a bread and butter plate. Actually, the "bazooka's" shell is comparatively small, for the gun is fired from the shoulder by one man, after it has been loaded by another man.

Gen. Campbell said the gun is actually a rocket gun and is "built on the Fourth of July principle."

"Carried in the hands of a soldier," he declared, "it can destroy any enemy tank on the battlefield today. It has been successfully used by our forces in Africa to destroy both fortifications and tanks. It is so simple and yet so powerful that

[*Continued on page 21*]

SHE ROLLS ON HARD RUBBER

Tom George, R. R. 1, Hammond, B. C., Canada, is the builder of this little Briggs & Stratton powered tricycle. The two rear wheels of the ½ horsepower scooter are under the enclosure below the seat. Tom gets a $3.00 Workbench award and a Certificate of Merit for this snapshot of his 3-wheeled scooter.

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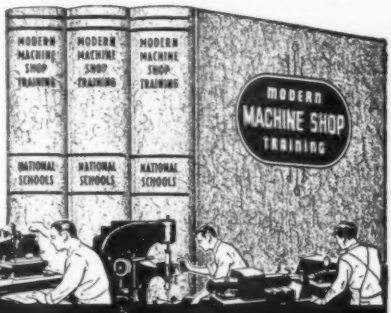

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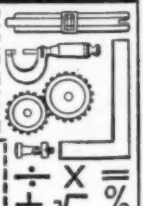

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## Editor's Workbench Chips

[*Continued from page* 18]

any foot soldier using it can stand his ground with certain knowledge that he is the master of any tank which may attack him.

"During recent operations, a small but strong fort gave considerable trouble to the Americans. One lone American soldier detached himself from the landing party, waded ashore and with one shot from his gun effected surrender of the fort."

Gen. Campbell said the "bazooka" is in mass production and is being supplied in quantity both to American troops and to our allies. The gun is so light, he said, that it can be carried on the run by two soldiers. He revealed at the same time that America has produced a new explosive "more than one-third greater in its destructive effect than TNT."

No further details of the "bazooka" have been revealed, but MI hopes to bring additional released details to its readers in our next issue.

### *Coming Attractions*

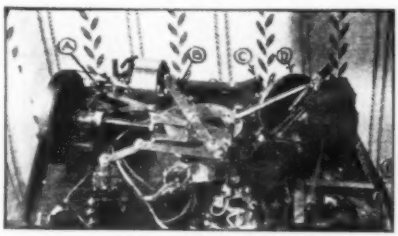
JOHN HAYS HAMMOND, "the millionaire inventor," has more than 600 inventions to his credit and is without doubt one of the greatest minds in the field of radio. He has built everything from a mechanical, radio-controlled dog to a medieval castle and now plans to make a device which will make it impossible for helicopters to collide in mid-air. The story of his life and his marvelous inventions is one of the most fascinating articles we have ever read. Written by George Daniels, it starts in next month's MI.

Here are some of the other features lined up for next month:

What Is a Battle? Have you ever wondered

[*Continued on page* 23]

### INGENUITY PLUS



A. H. Smith, 31 Seneca Ave., White Plains, N. Y., built this version of the MI record changer mechanism. An expedition to his workshop junk box furnished the materials which, although eliminating the bead chain, include cams, nuts, worm gear, pulleys, ball and socket joints, and other incidentals. It all goes to show that you can make almost anything—out of almost anything. Mr. Smith is now working out a set of selector plates that will accommodate warped records. The letters on the photo indicate: (A) threaded shaft (B) cross-arm (C) flat iron to selector shafts (D) cam and arm (E) L-shaped stop. For figuring it out, Mr. Smith certainly deserves the $3.00 Workbench award and the Certificate of Merit that this snapshot brings him.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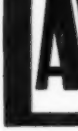

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## Editor's Workbench Chips

[*Continued from page* 21]

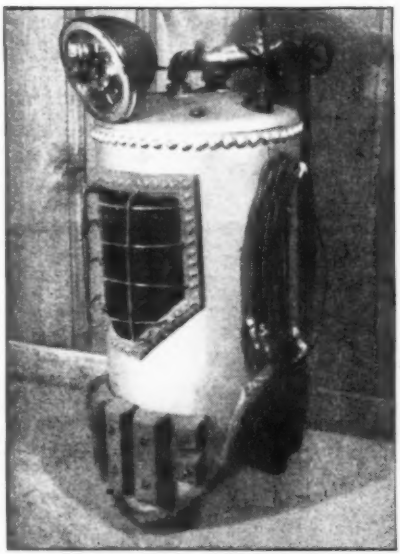
just exactly what goes on during a battle? News dispatches fail to give any clear picture of what all the shooting is about, how it happened to start and what made it end. Step by step, Major Malcolm Wheeler-Nicholson leads you through a battle in this article, showing you the exact science of it and what makes the wheels go 'round.

Tomorrow's Chemistry & Physics, tenth in MI's series, "A World You Never Knew," by Donald G. Cooley, gives you an exciting peek at the wonders of chemistry and physics which have blossomed under the stress of wartime research and tells you how these great advances will affect your life after the war.

Doctor of Bullets, tells you the almost unbelievable story of the work the Army and Navy medical men are doing in this war. Did you know, for instance, that out of 4,000 wounded Americans in the Southwest Pacific, only *seven* died? Richard Hanser tells you how, in his amazing article.

[*Continued on page* 25]

DIVING FOR PROFIT



Donald and Robert Kise, 1396 W. Idaho, St. Paul, Minn., made this 85 pound diving helmet with its sealed beam searchlight, last summer. Two tire pumps supply the air through regular garden hose, in dives as deep as 50 feet. The boys turned their outfit into a business, issued business cards, and went to work recovering sunken outboard motors, boats, etc., for their owners. They charged for the work according to the depth of the water and the value of the equipment recovered. Bob is a plane pilot in the Navy now, at 19, Donald writes. Don is 16. This snapshot brings Don a $3.00 Workbench award and a Certificate of Merit.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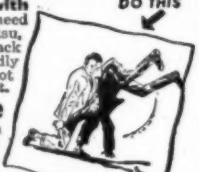

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# Editor's Workbench Chips

[*Continued from page* 23]

Flight's Pre-History, by Willie Ley, brings you some eye-popping information about flight in the animal and vegetable world, and how it is related to man's experiments with aviation.

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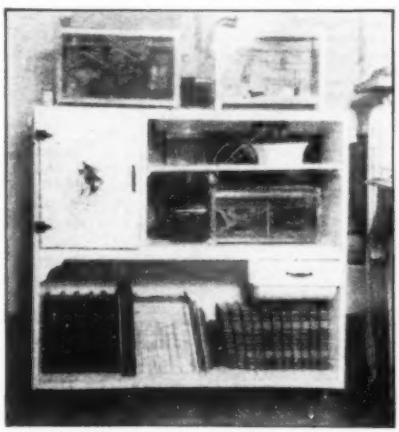
### *Designer*

A NEW contributor makes his debut in the pages of MI this month—he's Paul A. Lobel, and you'll find his work on page 96 in the form of two beautiful and useful cigarette box designs. Mr. Lobel has been one of the leaders in the field of industrial design for the past decade, having worked out many modern treatments for glass, metal and other materials. Perhaps his best known individual achievement was the development of the Benduro process for glass, which won the bronze and silver medals at the Paris Exposition of Decorative Arts in 1937. This process helped pave the way for much of modern glass usage in the decorative and utility fields.

Several years of study in New York, London, Paris, Rome and other European capitals back in the twenties convinced Mr. Lobel that a revolution in industrial design was imminent, and he immediately began experimenting with new mediums and methods. His resulting work was

[*Continued on page* 32]

NEW FURNITURE FROM OLD



Fifteen-year-old Arthur Segal, 119 West Lee St., Louisville, Ky., remodeled an old kitchen cabinet into this attractive piece of modern furniture. Now, with an artistic paint job and decals, it serves as a bookcase and a stand for tropical fish. It's a good illustration of workshop technique in these times of material shortages. A $3.00 Workbench award and a Certificate of Merit go to Mr. Segal.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Name---------- Age-------

Address ----------


# Editor's Workbench Chips

[*Continued from page* 25]

exhibited widely in Europe and the United States, some of it in the Metropolitan Museum of Art in New York City. He received numerous commissions to design decorative accessories for restaurants, hotels, department stores, private estates and yachts, and eventually organized the firm of Lobel-Uris to produce items in glass, metal, wood and leather.

Lobel's latest interest is the home craftsman, partly because of materials shortages resulting from the war, and partly because he believes the average hobbyist will welcome the opportunity to reproduce authentic professional designs for home accessories in his own workshop.

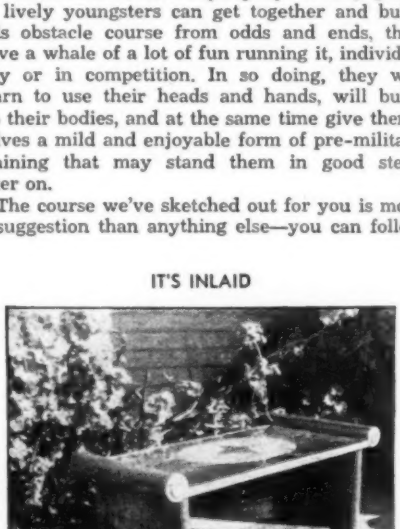
## *Up and at 'Em!*

IF YOU'RE over 17 don't bother to read this, unless you're far enough over that age to have a young son *under* 17. Middle-aged men with bay windows won't be interested in covering the Junior Commando Course shown on pages 104 and 105, though it might actually do them more good than the kids.

Anyway, we call your attention to it because it will serve at least a triple purpose. Any group of lively youngsters can get together and build this obstacle course from odds and ends, then have a whale of a lot of fun running it, individually or in competition. In so doing, they will learn to use their heads and hands, will build up their bodies, and at the same time give themselves a mild and enjoyable form of pre-military training that may stand them in good stead later on.

The course we've sketched out for you is more a suggestion than anything else—you can follow

IT'S INLAID



Ray Erkson, 1169 Dana St., Mt. View, Calif., built this handsome inlaid table. A four-pointed star design decorates the top, and a more elaborate one can be seen on the end. The excellent workmanship on this project brings Mr. Erkson a $3.00 Workbench award and a Certificate of Merit.

## Editor's Workbench Chips

it as is or, better still, develop other ideas of your own. In any case lay out your course plan on large sheets of wrapping paper, after the location has been selected. Any empty lot or field will do, or possibly your school will co-operate.

### *The School Shop*

FOR the benefit of those who are just beginning the Aviation Lessons in The School Shop on page 108, it might be a good idea to give you a brief summary of the subjects covered so far and those to be discussed in the future lessons. As you know, The School Shop changed hands in the February MI and since that time has been conducted by Gilbert Paust, a licensed C.A.A. Ground Instructor and Lieutenant in the Civil Air Patrol.

Lesson 1 in February MI covered the history of aviation from the accounts of early mythology up to the present. In the March issue, Lesson 2, The Plane of Today, there was discussed the design of the modern plane and the function of the various control surfaces. Lesson 3 in April, What Makes It Fly, contained a simplified study of Aerodynamics and plans for constructing a hand model "smoke tunnel" which can be used for demonstrating the action of air as it passes over an airfoil. In the May Lesson 4, How To Fly, the author took you for a spin around the airport in a Piper Cub and showed you how really simple it is to make the light plane behave. In this issue you will find Lesson 5, Safety of Modern Flying.

It was our intention to continue in the future with a discussion of the Civil Air Regulations and the safety measures instituted by the Civil Aeronautics Authority, but in view of the numerous requests we have received for lessons on Navigation, Meteorology and Aircraft Maintenance, we have decided to outline briefly the C.A.R. in Lesson 6 and then tackle these subjects. This, then is our outline of the next six lessons:

Lesson 6—Air Traffic Rules
Lesson 7—Maps of the Earth
Lesson 8—Instruments for Navigation
Lesson 9—Flight Maps and Piloting
Lesson 10—Dead Reckoning
Lesson 11—Solving the Drift Problem

These will take you through Navigation. Lesson 12 and those thereafter will continue with Meteorology, Engines, Parachutes, etc.

### *Book*

DON COOLEY'S article on Electronics in our April issue, aroused so much interest in the subject among our readers and brought so many inquiries for additional material that we are pleased to be able to recommend a book on the subject. It is Drake's Cyclopedia of Radio and Electronics, written by Harold P. Manly and L. O. Gorder and published by Frederick J. Drake & Co., 600 West Van Buren Street, Chicago, Ill. It is a comprehensive, non-technical volume.

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# Win the War at Home

**By W. H. FAWCETT, Jr.**

**President of Mechanix Illustrated**

One of the most inspiring stories I've run across in a long time was a little news item tucked away in the back of the paper the other morning about a War Committee of the Blind, representing three organizations devoted to the welfare of blind persons. Its purpose is to co-ordinate and centralize all the work being done by the blind toward winning the war, and will participate in whatever activities are planned by government and war agencies. Now, I'm willing to lay a small bet that when the war's over it will be found that these blind folks have done a better job on civilian defense than most of the rest of us.

**America's greatest war plant covers a million and a half square miles and employs thirty million people. You guessed it—it's the American farm. With so many Americans under arms the call has gone out for emergency volunteer farm workers. Emphasis is put on young people of high-school and college age. They are organized as Victory Farm Volunteers and the goal is to get 500,000 young folks out into the country this summer doing the finest kind of health-building work for periods of from one to four months.**

**About half will live at home and commute to the farm and the others will live in government supervised camps. State and local Victory Farm Volunteers committees will decide on working conditions, wages and hours. The project is under the direction of the Extension Service of the Department of Agriculture but you should be able to get full details from your local Civilian Defense Volunteer office. This summer is going to be full of fun and valuable experience for thousands of young Americans. They will get to know and love the American earth as never before—back on the farm where the music of the noon dinner bell sounds even more "solid" than Harry James' horn, and where "making with the corn" is something to be proud of.**

These are the days when ancient notions are being exploded and myths are being blown sky-high. One of these is the "old husbands' tale" that women can't keep a secret. Sir Robert Watson-Watt, inventor, started ten years ago working on one of Britain's most vital war secrets—radio location. He started with three stenographers but his staff grew until more than 1,000 women knew the details. "I've never known any to reveal the secret," Sir Robert says, "or even to give the slightest indication there is a secret to reveal."

**Let's start a collection of Victory "wrinkles." Here's a good one to lead off with: when you make a purchase that is not too bulky say to the clerk, "Don't bother to send it. In these days it's patriotic to carry your own." And if it's a single article and not fragile say, "Don't wrap it—let's save the paper."**

Civilian Defense experts tell us that home-made gas masks of muslin with pockets containing soda provide little protection against war gases. They are designed for chlorine gas—the first kind used in World War I—but it's obsolete now. Modern chemical warfare calls for a modern gas mask. As a household hint this is a little grim but there's nothing like keeping up with the times.

**This year it looks like our feet are going to carry us a lot farther than gasoline will. And now that summer is here hiking and hill-climbing have come back into their own. This puts the emphasis on foot-gear and here again the slogan is, "Make 'em last." The first rule of shoe care is: buy shoes that fit you; too large and they wrinkle, too small and the leather stretches and loses its life. Remember this the next time you take your ration book shoe shopping. Shoe trees are essential for long wear. Having two pairs of shoes, worn on alternate days, will practically double the life of both pairs—gives the leather a chance to dry out and keep its life. Saddle soap is better for shoes than commercial polishes containing turpentine. Dry damp shoes at room temperature and keep them away from radiators—quick drying cracks them. Watch the heels and don't let them get run over—a crooked heel throws the foot out of line and makes the shoes take an awful beating.**

W. H. Fawcett, Jr.

# DEATH ON SUBS

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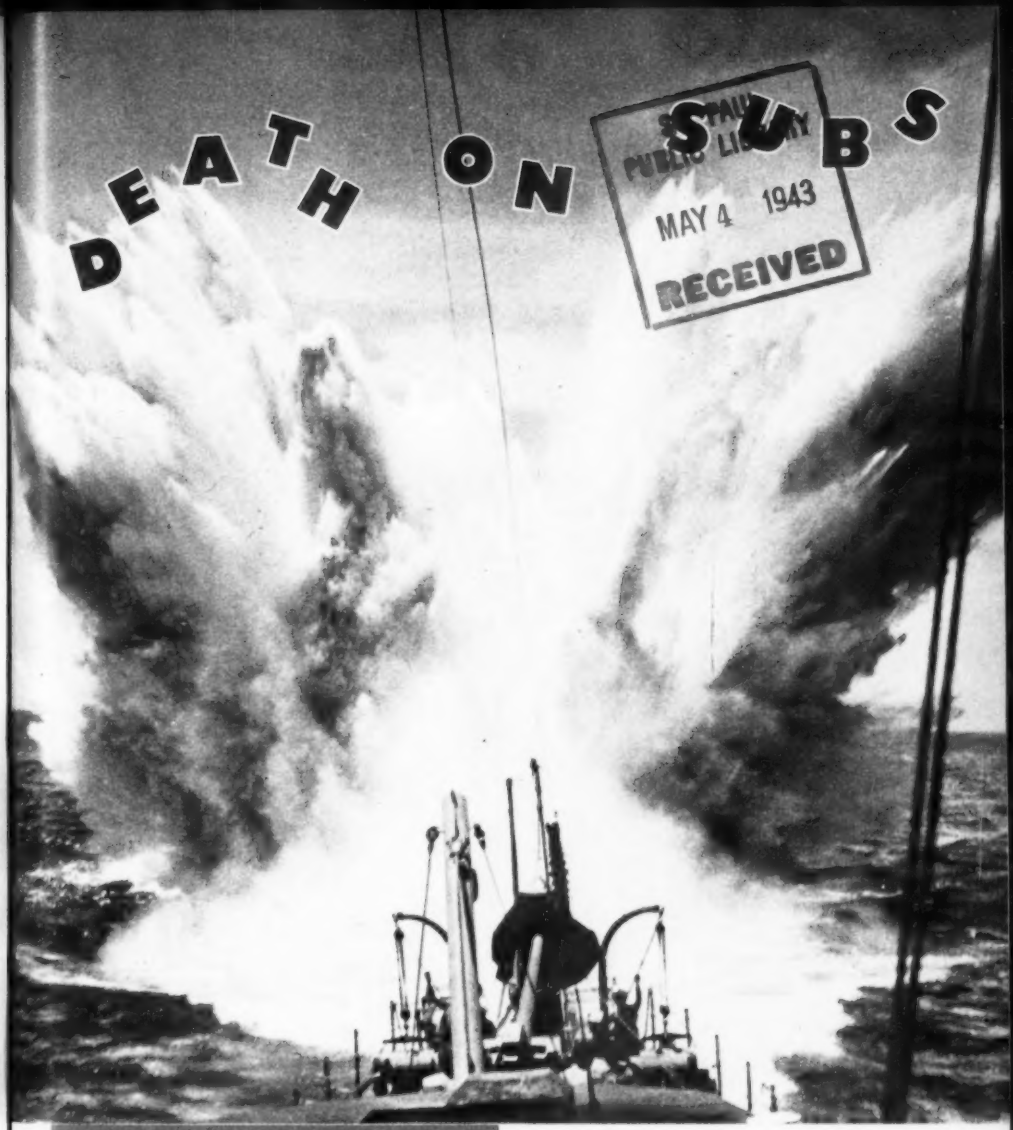


*All Photos by U. S. Navy*

Bloom of death: two depth charges explode simultaneously as a speedy Navy PC boat launches its deadly attack against an Axis sub, as described by the author.

by Lieut. W. G. Schmidt, U.S.N.R.

WE HAVE been in port for several days awaiting our next assignment and now the Captain of our ship has just returned from a Convoy Conference. It means that we are going out to sea again on another mission.

Ours is a PC (Patrol Craft) in the Surface Escort Group of the Eastern Sea Frontier. She is a trim ship of 173 feet, manned by five officers and around 60 men. Quarters are crowded but not uncomfortable, every inch of the vessel being put to use. I am Executive Officer, second in command.

Orders read: "Obtain from PORT DIRECTOR . . . a list of vessels to be escorted, the times when vessels will be at Sea Buoy,

This unusual photograph caught an "ashcan" as it was fired from PC boat's deadly stern "K" gun.

standard routes, copies of routing instructions to the merchant vessels." We have also obtained the call letters of the ships, their destinations, the heights of their masts, their cargoes and communication plans, and the speed and convoy procedure.

Usually we are just one of the convoy escort, taking our orders at sea from the Escort Commander, who may be the Captain of a destroyer or corvette.

On his return from the conference the Captain had ordered, "Prepare to get underway." Immediately preparations had been made to get the ship in trim for sea duty. Last supplies of fresh water, stores and ammunition have been taken aboard. The gyros have been started. The main engines have been tested and warmed up. The whistle and siren have been tried.

**Continued**

**Death on Subs**

Now it is 0300 and we are ready to cast off. The night is dark, with the moon hidden behind heavy clouds. Mist fills the air, which has the bite of early morning chill. The Captain is on the flying bridge; I am in the pilot house alongside the steersman. Our red and green running lights glow hazily in the mist.

"Man the special sea details," comes the Captain's order through the tubes. "Cast off all lines aft." The ship's stern eases away from the pier. "Cast off number three. Take number one to the winch. Cast off all lines." We are now free from the pier.

The whistle utters one long shrill blast to notify other vessels that we are backing out. "Starboard engine back one third. Left standard rudder. All engines stop. Rudder amidships." We have moved out toward the center of the dock. "Starboard engine ahead one third. Port engine back one third. Left standard rudder." We are in the bay. "Stop port engine. Ease rudder. Rudder amid-

ships." The bow of the ship is now turned toward the sea.

"All engines ahead one third." The bells ring. "Secure all gear for sea." As we gather speed down the channel, we pass the dark shapes of the ships which will make up the convoy: heavy-laden tankers and cargo ships with high sides, which dwarf us by their size.

"Steady as you go," the Captain tells the steersman. We proceed at varying speeds, skirting ships, and slowing down as we approach the harbor net. The gate is open and we pass between the small net-tenders riding quietly at either side.

Once we have glided through the net, there is a noticeably increased alertness. Navigational lights are on. Blowers speed up and engines throb more heavily as PC— sweeps toward the Sea Buoy, where the convoy is to assemble. Kapok life jackets are donned, and safety bars removed from the depth charge racks. The crews stand by the three-inch guns fore and aft. The submarine detector pings. We are ready for action.

We zigzag through the choppy sea, bobbing like a cork on the waves, as the sun comes up and the convoy lines up in formation under guidance of the Convoy Commodore, a naval officer aboard one of the cargo vessels. The blinkers of the Escort Commander flash: Take patrol station. We acknowledge and rush to our position. The convoy heads south.

A blimp rides high above us, scouring the sea with plump dignity. Planes soar ahead and behind, circling the convoy in wide sweeps. We dash in and out, zigzagging, circling, doubling back and then ahead again, ever on the alert for the enemy. The lookouts strain through their powerful binoculars for the tell-tale signs of danger: a periscope, an oil slick, any unusual surface indication. In the pilot house the sub detector shrills. Sometimes a school of fish, a large whale, a sunken wreck, or a coral formation, will cause the machine to sound as though its waves had touched an enemy marauder. It is often hard to distinguish the difference, but the PC— will take no chances. She will drop a pattern of ashcans to make sure that no submarine escapes.

There was a time last year when enemy submarines swarmed through these waters wreaking havoc on our shipping. But that was before we were fully ready for them. Now we have made it so hot that few of them dare come within range of the Eastern Sea Patrol. But submarines are still an ever-present danger and we are constantly on the alert for them.

All through the day we take our turns on watch—four hours on, eight hours off, but nothing much happens. We sight several wrecks, grim reminders of the days when the Nazi submarine packs were having their field days. We come across an occasional buoy, covered now with black oily grime. These mark the spots where our ashcans have been dropped on subs.

Several times the sub detector has whined its sharp warning. We have sped to the areas indicated and dropped patterns of ashcans, but these have been false alarms and

A PC craft under way on Atlantic submarine patrol duty.

Nerve center of the PC boat is its wheelhouse, shown in unusual photo above.

we take them in our stride. We continue our patrol, darting ahead of the convoy and then at varying speeds and in zigzag courses we return to our original position. This goes on constantly. We must not relax. We may run across a sub without warning, lying on the bottom perhaps, waiting for night to emerge from the sea. There may be one hiding in the lee of a wreck, a likely hiding-place.

Now it is our first night out and we are, if possible, even more alert. A message comes from the Escort Commander: Sub sighted. He gives us the latitude and longitude and orders: Proceed and conduct search. "All engines ahead full," the Captain orders. The alarm sounds general quarters and all hands rush to their battle stations. Up from the hatches hustle the deck crew who are not already topside, some of them hastily pulling on their clothes.

The depth charge crews stand by at the stern racks and the K gun, ready to feed the deadly cans of TNT into the breeches. Fore and aft, the steel helmeted gun crews are ready to meet with hot lead any sign of the sub on the surface.

As we approach the location given us, the sub detector in the pilot house sings. The sub has heard us on his hydrophones and is trying to submerge in an effort to escape our attack. But he cannot hide from us; our detector is dead on him and he cannot get away.

As our detectors tell us we are directly over him the Skipper gives the word. We let depth charges out over our stern, and fire the K guns, sending more charges out on either side. The big cans, each loaded with 300 pounds of TNT, arch in smooth parabolas, their firing arbors giving them the appearance of giant mallets. They splash into the sea astern.

A muffled roar comes from beneath the water as the depth charges explode.

The concussion flutters the ship with vibration, the force of it shivering every man aboard. The sea where the ashcans have dropped arcs up like the top of a globe and then a huge geyser bursts through, rising high in a solid mass from which white spray flies as from an umbrella.

We race forward, circling the area and dropping more charges in a pattern. If there is a submarine below, it is probable that our ashcans have spelled his doom.

We circle back over the area to see the result of our depth charges. There is a small oil slick on the surface and then two larger slicks. The wily sub commander may have discharged oil to fool us into thinking we had sunk him, but the two larger slicks indicate that we probably shattered his saddle tanks and made it impossible for him to return to his base—if he still can navigate.

German submarines are known to have extremely strong pressure hulls and it is quite probable that we have failed to tear him apart at the seams. But the explosive force of our ashcans can do other damage which will end the career of this undersea pirate. The great pressure of the water on the hull can tear the sub apart inside, immobilizing the controls, killing the men by concussion and [*Continued on page* 154]

# HALF HELICOPTER,

# HALF AIRPLANE

*the story of the Convertaplane*
as told to George Daniels
by Gerard Herrick

Gerard P. Herrick, inventor of the Convertaplane, was commissioned captain in the U. S. Army Air Corps in 1918. His knowledge of physics and mathematics, acquired earlier at Princeton, equipped him to lick one of the outstanding aircraft problems of the day—the tailspin. He evolved a mechanism which enabled the flight student to neutralize all controls by simply pulling a lever. The device was built at Love Field. His experience in the Air Corps convinced him that the ideal aircraft would be a combination helicopter and airplane, and his Convertaplane is the result.

LITTLE Jimmie Jr. looks up from his 1950 Model tricycle toward a tiny speck just above the horizon. He watches intently as it streaks nearer at more than 6 miles a minute, then he calls. "Hey, Dad! better get the lawn mower out of the way—Ma's coming in for a landing!"

About 10,000 feet over head, Ma relaxes in the roomy cabin of the family Convertaplane. Far below, the familiar pattern of the neighborhood roads tells her it's time to cut in the rotor action for a landing in the side yard. She eases back on the throttle, and the airspeed indicator swings slowly around. The pointer passes the miles-per-minute markings on the rim—5 miles per minute, 4 miles per minute, and so on down to a mere 100 miles an hour.

Then a flip of the little lever under the dash causes a strange thing to occur. The wing above the cabin suddenly whirls from its position across the centerline of the ship, and starts to rotate! Faster and faster it spins until the eye can barely make it out. The speed of the ship drops to a snail's pace. It hovers while Ma tamps out her cigarette, and then begins its vertical approach to a landing area no larger than a tennis court!

Capable of rising or landing vertically as a helicopter, this amazing ship converts itself in mid-air to a high-speed, efficient, long range airplane or from airplane to low speed vertical flight helicopter. And as Ma brings the ship to a stop beside the garage, you'll probably marvel at the fact that one of the

Unusual view of Convertaplane was obtained with ship on check-up platform above. Rotor-wing is rigid from tip to tip, shaped like conventional tapered wing.

first Convertaplanes was actually flying in 1943!

The 1943 Convertaplane is almost as thrilling a spectacle in operation as the 1950 Model to come. As far back as 1937, Test Pilot George Townson flew a series of sensational demonstration flights in the 125 horsepower experimental Convertaplane. U. S. Navy's Commander J. D. Barner and N. A. C. A.'s Russel Robinson were among those on hand as pilot Townson, in the Convertaplane, roared across Boulevard Airport on the outskirts of Philadelphia. A few minutes earlier, a group of engineers and aircraft experts had craned their necks to watch this little known ship convert from airplane to rotor plane at 1,700 feet, but this time a conversion was to be made at only 50 feet!

The crowd and the cameramen that lined the runway turned as a man, as the Convertaplane shot past them. In the cockpit, pilot Townson reached up, grasped the overhead lever that would release the upper wing for rotation. As the ship skimmed over the center of the airport, that slim upper wing suddenly swung into action as a rotor, and to the amazement of the spectators, seemed to lift the machine almost vertically in its flight path. Then, with nearly all of the field behind him, pilot Townson eased off on the throttle. Observers clenched their teeth and awaited what seemed an inevitable crash into the undergrowth and stubble beyond the airport. But the incredible Convertaplane and its intrepid pilot settled gently to a feather-like landing, with several hundred yards to spare!

"Half plane, half gyro" was the way designers referred to the ship in those days. But that was only the beginning. "Half plane, half helicopter" is the need of today—and the Convertaplane answers that need.

Since that memorable demonstration five years ago when Commander Barner remarked, "The Navy is certainly interested in its possibilities. . . ." Work on the Convertaplane has been shrouded in secrecy. Even today, only a part of the story can be told.

Perhaps the most unusual revealable feature of the Convertaplane is the design of its *rotor-wing*. Unlike the rotors of the familiar autogyro and helicopter, the Convertaplane's *rotor-wing* blades are not separately hinged at the hub, and do not bend upward in operation. Built as a combination rigid, two-bladed rotor, and cantilever wing, this *rotor-wing* tilts as it spins. So in flight, this unit inclines at a slight angle to one side in response to the airstream, in rotation, and is automatically checked at the proper limits.

A special wing section had to be designed for the *rotor-wing* because of the fact that one half of the surface travels backwards when the unit is in rotation. The answer was found in a wing that presented the same shape in cross section on both leading and trailing portions. To use a colloquialism, it's the same shape coming and going.

An interesting sidelight on this peculiar airfoil section is the fact that its shape can be developed to suit practically any loading condition by plotting an equation on graph paper —in a similiar manner to that by which the famed Davis airfoil is worked out. Tests in the wind tunnel of the Guggenheim School of Aeronautics show that the almost unbelievably simple *rotor-wing* section can compete in performance

Continued

## Half Helicopter, Half Airplane

with conventional designs—and it can do it traveling forwards or backwards!

Equipped with this type of wing, the Herrick Convertaplane can take off, climb, fly, and land with a full load, as a conventional biplane when the *rotor-wing* is locked stationary in a cross-wise position. With the *rotor-wing* rotating in helicopter fashion, it

Roomy side-by-side seats and simple instrument panel make the Convertaplane a pleasure to fly. Cabin jobs come next.

can do the same things with the same loads—but minus the conventional plane's take-off and landing run.

It can also be revealed that the newest Convertaplane design eliminates the bottom wing, making the ship a full-fledged helicopter, when the rotor is turning—and a full-fledged airplane without an inkling of helicopter, when the rotor is locked for high-speed flight.

With a completely dead engine, the Convertaplane can glide for great distances as a conventional airplane, enjoying the wide range afforded by near-perfect streamlining. Flying at airliner levels, it can at all times select a landing spot from an area of about 500 square miles, glide as far as 10 or 15 miles to it if necessary, and then start its *rotor-wing* spinning to land safely straight down to a barnyard or rooftop, as the case might be.

While vertical take-offs are within the scope of the newest Convertaplane design, the ship as a helicopter, is intended mainly for 45° ascent, as this angle enables it to carry a greater load. In ordinary operation, this means that you need about 60 feet of forward travel to clear a five story apartment house.

The controls of the Convertaplane are at present the same as those of conventional airplanes. The only addition is the *rotor-wing* lever which is used to convert the ship from one type of aircraft to the other. Whether it is flying as a rotating wing aircraft or as a conventional fixed wing machine, the operation of the controls is the same. The only difference as far as the pilot is concerned, is in the ship's performance.

Setting the wing in rotation reduces the speed and increases the lift. Locking the wing in conventional position permits the high speed of a regular airplane.

Your family Convertaplane can also be your family car, for coming models will include equipment for driving along the highways or city streets when short errands make road travel simpler than flight. If, for example, you want to run down [*Continued on page* 143]

Pilot pulls lever as shown, to convert ship from one type to the other. Release mechanism above lever starts rotor-wing turning. Locking rotor-wing for speed flight is equally simple.

# WAR WONDERS OF RADIO

A fantastic radio that needed no operator paved the way for a great American victory over the Japanese. Left high in a tree by three Marines, it sent us vital information—

by Lester David

GUADALCANAL—July, 1942.

It is night, and Jap soldiers, feeling secure in their unchallenged possession of the whole island, sleep in their tents and trenches. Jap work crews rest from their building of the airfield from which they expect to blast the vital United Nations communications lines across the southwest Pacific.

A small boat slithers through the light mist and glides silently aground on the beach. The officer in the bow whispers quick, urgent orders and three U. S. Marines, submachine guns cradled in their elbows, wade ashore. A fourth Marine carefully lifts a foot-square box from the bottom of the boat, straps it to his back, and follows.

In a few seconds the little party is lost in the heavy shadows of the jungle growth near the beach. Suddenly a twig snaps, leaves rustle as they are brushed impatiently aside. The four men freeze as still as statues. But the Jap patrol passes by. The sounds recede. Swiftly and silently the Marine carrying the box digs the lumberjack's irons on his feet into the bole of a tall tree, and begins to climb. Near the top, deep in foliage, he carefully and securely fastens the little, inconspicuous box. Two minutes more and he is down, and the party fades rapidly back to the boat, and slides off across the silent water.

Guadalcanal—August 7, 1942.

Dawn. American warships standing off the island can see through the clear air the first signs of the Jap encampments ashore stirring to life. At an order the big naval guns speak, and speak again, and a hail of shells rains death and panic on the completely surprised Japs. Another order, and thousands of ready Marines spill over the warships' sides into fast small boats, to swarm ashore with full advantage of a favorable wind and tide. The battle has begun which for the first time will wrest from the Japanese Army a position it has wholly occupied, which will spike the entire drive of Jap arms to harass American communications. Had that battle been hampered by bad weather, it might have been an American disaster. That it was an American triumph was largely because of that little box in the tree.

For that box was a miniature battery-operated radio station. Every hour, for more than three weeks, it had broadcast reports on the temperature, wind velocity, barometric pressure, relative humidity and tide conditions on Guadalcanal. Every hour, for more than three weeks, radio operators on American warcraft within a 50-mile radius had noted the vital reports. For several days all troops and supplies were ready for the attack on Guadalcanal, but each day the little radio warned of low pressures, betokening storm; of high humidity, indicating fog. Then Navy meteorologists began to get the picture they

wanted: weather clearing, tides right, wind slackening. And with the completion of that picture, the fate of the Japs on Guadalcanal was sealed.

Details of the apparatus that did this important job remain, of course, strictly secret. It is known, however, that it is an adaptation of the radiosonde—a device which is used to explore the atmosphere vertically for data on high-level weather conditions, reporting them to the ground through a small radio transmitter. It is sent aloft suspended from a balloon, which bursts when it reaches the rarefied atmosphere of the stratosphere, and the radiosonde descends by a small parachute.

Remarkable as it is, however, the little box is only one of the dozens of electronic wonders being created day after day in the Signal Corps General Development Laboratory.

There many of the country's foremost electrical engineers huddle over work benches with wires, tubes and multitesters, their ingenuity and research harnessed to the tactics and strategy of war. Radio, a force to cement nations in peace, has become a powerful weapon to facilitate destruction. So the lights burn until daybreak and the eyes grow red-rimmed in the labs as the engineers work to equip American fighters with superior radio equipment and weapons.

The General Development Laboratory, operated under the Materiel Division, has 7,000 employes, military and civilian, working to perfect radio, wire, sound and light equipment used for communication purposes by the Army ground forces, meteorological equipment primarily for the artillery and air commands and radio direction-finding and locating apparatus to detect enemy air and surface raiders at great distances.

One of the great success stories of this war is the development and perfection of radiolocation. Five years ago it was virtually unknown, existing almost entirely in the imaginations of a few men. Today radio locators guard cities and vital installations, and give warning of aircraft as much as 150 miles away. They can even aim and fire anti-aircraft guns, in any kind of weather, with far higher accuracy than any human gunner could achieve.

Aloft, in night fighter planes, radiolocators reach out into the darkness to spot enemies. The disasters that befell the bragging Luftwaffe over England during the Blitz were attributable in no small part to the excellence of the R.A.F.'s radiolocation instruments. At sea, radiolocators can probe beneath the water for submarines or mines, quickly and surely.

Weapons as complex as Frankenstein's laboratory, weapons so small they fit snugly into a corner of a soldier's haversack, weapons to save lives and weapons to destroy. . . .

There is the little gadget, just perfected, which would have avoided the ordeal experienced by Capt. Eddie Rickenbacker and the others who drifted for weeks on life rafts under the burning Pacific sun before help came.

It is a tiny, water-tight radio transmitter, sealed to a single frequency. Eventually there will be one in every plane, ready for

Corp. Edmund Eckman demonstrates a compact radio direction finder at Ft. Monmouth,

Continued

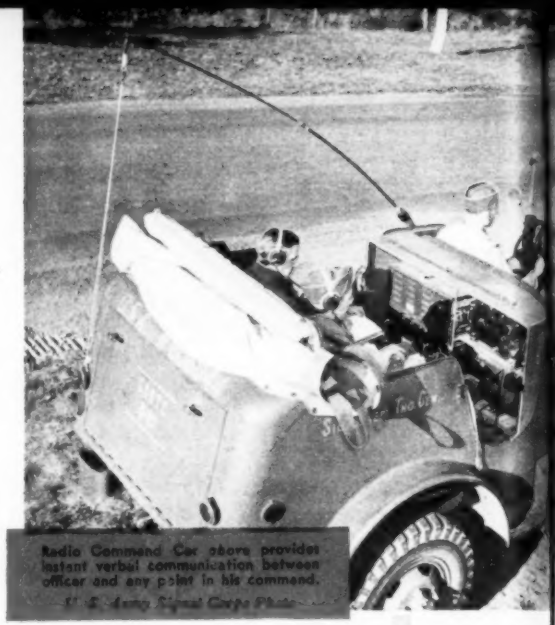
## War Wonders of Radio

duty the moment a flier is forced down in mid-ocean. All receiving stations with direction finders go into action when word is flashed that a plane is overdue or missing. At hourly intervals the little transmitter releases a signal which, when caught by the direction-finders, reveals the spot on ocean or desert where the lost men await rescue.

Little gadgets, big gadgets. In the deserts of Tunisia huge American trucks—mobile broadcasting stations are racing over the sun-baked terrain. They transmit instructions as they careen along, enabling field commanders to maintain continuous contact with planes, ships and armored columns no matter how swiftly they move. We had portable transmitters before this country entered the war, but they could not be used in motion. Trucks bearing them had to stop whenever the equipment was to be used. But modern warfare demands greater efficiency and soon a self-contained mounted transmitter, having a range of 100 miles, was developed and sent into action.

The hows and whys of these devices cannot be told now. Much of the experimental work in radio communication and detection is done in the utmost secrecy. In time of peace some of these amazing developments would be heralded with huge advertisements trumpeting "next year's models." Today they just slip quietly into mass production for war use.

Among the many and complex obstacles the General Development Laboratory is hurdling, for example, are the problems met in making radio reception and transmission in vehicles as smooth and clear as possible.



Radio Command Car above provides instant verbal communication between officer and any point in his command.
U. S. Army Signal Corps Photo

Pack radio, powered by elbow grease, via cranks. Operator sends message during maneuvers, by key strapped on knee.

Radio carried by soldier at *left, below*, establishes communication between operator *(right)* and headquarters.

*U. S. Army Signal Corps Photos*

There are ignition noises from powerful motors which blot out reception; there are roaring mechanical noises which deafen operators and make incoming orders difficult or impossible to hear; there are high frequency vibration impacts from hard-surface roads which loosen tubes and break wires. The engineers work and improve and improve again.

One of the most important jobs now undertaken by the laboratory is to perfect static suppression in automotive vehicles, tanks and armored cars of all sorts. To eliminate the propagation of radio interference by the electrical systems installed within them, these vehicles are being shielded in unique ways. Because of the vast increase in the number of vehicles rolling from the production lines to the fields of combat, this research has developed startling methods of static suppression which will prove a boon to civilians after the war. As the new types of radio sets are delivered to the troops in the field by the manufacturers, the laboratory sends engineers and technicians to assist in their proper installation and to see that the proper suppression systems are applied to the vehicles.

Skilled service men and sometimes the engineers themselves stay with the systems in the field in many cases, not only to see that the equipment is correctly installed and used, but to check on performance under field conditions. "Bugs" are always being found—and licked.

Most often, it is the laboratory expert, the research engineer, who develops these instruments, but the soldier in action who uses the equipment has sometimes helped too. The Army needs equipment that works better than anything it has, and improvements come with use in battle or on maneuvers.

There is Sgt. Timmy MacVane of the Signal Corps, assigned to an armored division. For weeks he goes through maneuvers and day by day he becomes more convinced that the dial on his radio set is faulty and that he can improve it.

At night he works on a new device and when he has completed it, he takes the idea to his immediate superior. It's good, they decide, so up ahead it goes. It comes to the attention of the General Development Laboratory, where it is turned inside and out and several radio sets are altered to include the proposed improvement. Then, if it is desirable from a technical and production standpoint, it's in. And Sgt. Timmy has added something toward ultimate victory.

Soldiers in the field and in the laboratory fight not only with guns, but with electricity, saddling the electron for battle and victory.

Improved *Walkie-Talkie* radio in operation during maneuvers at Pine Camp. Light in weight, unit includes an aerial.

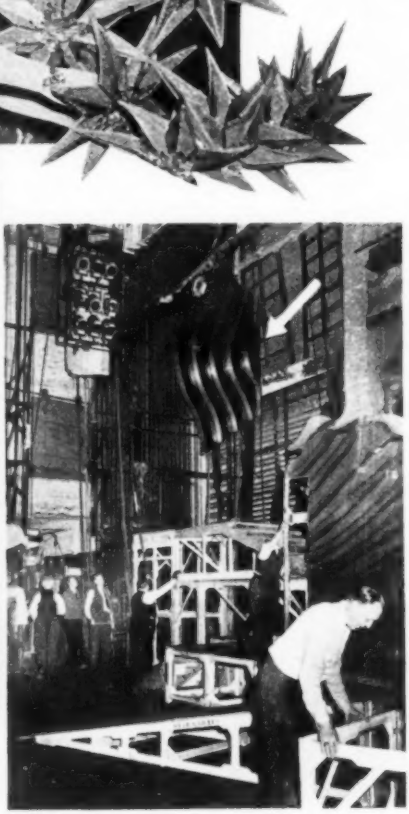
Radio-equipped ambulance co-operates with search airplane in reaching planes forced down. Plane directs it to scene.

*Photo by Air Corps U. S. Army K. F. Photo Section*

# THE MECHANIX

by Louis Hochman

**Stairways hang in mid-air, luxurious rooms split in half and ride on tracks while tons of scenery glide about in silence. But nobody notices a little thing like that when Gypsy Rose Lee is in action. Here's how it's done.**



Gypsy Rose Lee, *above*, is well built, but not strong enough to withstand impact of 400-pound prop stairway, *right arrow*, which nearly fell on her when cable snapped backstage.

"LOOK OUT!" yelled a stagehand, and four men and a girl scrambled for their lives as 400 pounds of wood and steel came crashing into the spot they'd been occupying just a split second before. The four men were stagehands, engaged in the task of hoisting a 400-pound prop stairway into the air to get it off the floor, when the cable parted and the piece came crashing down. The girl was Gypsy Rose Lee!

On the other side of the curtain, howls of laughter rose from the audience, who, blissfully unaware of the near tragedy that had occurred, were splitting their sides at the antics of Chaz Chase, comedian in the Star and Garter show, now packing them in off the Great White Way.

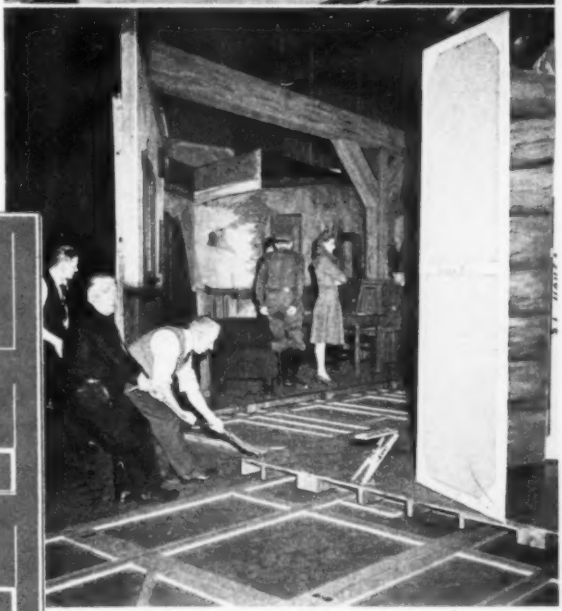
This is just one of the many problems confronting backstage mechanics, who have to guard against every eventuality, in the course of their hectic activities. Fortunately, they shoulder their responsibilities well, for such accidents are extremely rare. Always on the alert, they continually check and recheck props, ropes, and cables, looking ahead and doing their level best to be ready for anything. Every possible precaution is taken, not only against accident, but against mechanical gremlins that might interfere with the smooth operation of changing sets and scenes during a performance. Thousands of pounds of scenery, props, and portals hang high overhead, presenting a constant threat to performers and stagehands, should they become lax in their care of the riggings that support them. Ropes supporting heavy pieces usually have a

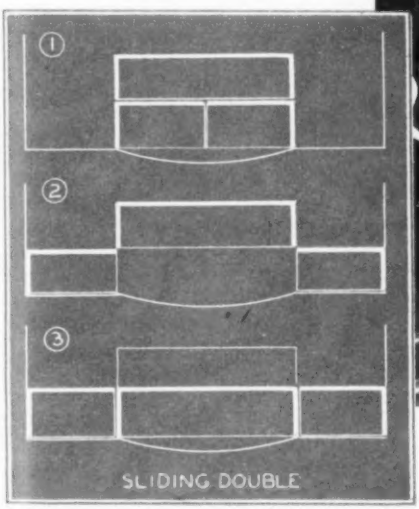
# OF GYPSY ROSE LEE

second safety rope just in case one should break. Riggings are constantly inspected, as well as props which are to support the weight of performers, and nothing is overlooked.

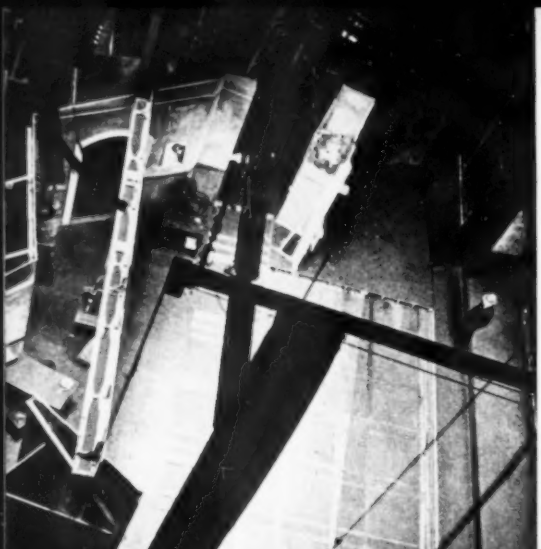
When the curtain drops at the end of a scene, few in the audience realize the beehive of activity that goes on behind it. They gasp with amazement when the rising curtain reveals an entirely different scene, changed in every detail, with new walls, furniture, lights and actors. How was it done in so short a time? What went on behind that closed curtain? Where did all that new scenery come from? The answer lies in backstage mechanics, the problems of which have been boiled down to an exact science since the days of Shakespeare, when printed signs denoted the presence of a horse, house, or cow!

Contrary to popular belief, the floor space backstage is not a vast area capable of accommodating a pocket battleship, but in fact is an overcrowded, overrun, minor section of the stage itself. Approximately three quarters of the floor space of that stage is used for the





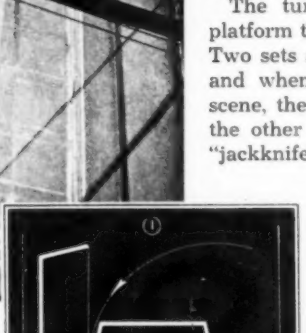

Back platform set recedes, *top photo*, as stage hands pull in sides of a "sliding double" between scenes of The Russian People. Abe Kurnit, inventor of the tracks, directs job. Stage hands in *lower photo* remove foreground set to make room for rear one. Heavy lines show set movements in "sliding double" scene change.



"Sliding double" *photo above*, viewed from files, with stage apron at right. "Jackknife" change is diagramed *at right*. Arrows indicate incoming scenes.

presentation of the show, and the remaining one quarter has to accommodate, in whatever manner possible, the bulk of props and scenery.

As a rule, backstage problems fall into two categories; the musical show, and the dramatic play. The former usually presents the greater difficulty, for it generally utilizes a greater portion of the stage floor for its giant dance reviews, and has more scene changes with more elaborate settings. However, the show is usually timed to permit more time for scene changing, for after each big scene, a colorful curtain comes down and a specialty number is put on in front of this while the stagehands go to work behind it.



"Turntable" change, *above* is simple. Turning platform brings new scene to front; old one to back for revision.

The dramatic play, however, must have much faster scene changes since there is no auxiliary entertainment between scenes, and the continuity depends on quick changes. Toward this end, many ingenious systems and devices have been perfected, such as turntables, "jackknife" changes, rolling platforms. All these changes have one thing in common. They are built on false floors or platforms which are equipped with casters to permit them to roll into place instantly.

The turntable consists of a circular platform that revolves on a central pivot. Two sets are built back to back on this, and when it is desired to change the scene, the table is simply revolved until the other scene comes into place. The "jackknife" change is executed by two platforms, facing each other from opposite sides of the stage, each attached to a front corner of the stage by a pivot. When a set is pushed into place, it turns on its pivot until it rests flush against the front apron of the stage. The other platform is pivoted back and out of the way. To change the scene, the first platform is pivoted back out of the way and the second one is pivoted into its place.

Where the stage dimensions permit, three rolling platforms can be used, each containing a different scene. One platform stands before the audience, and the other two stand out of sight on either side of it. For changing the scene, the first platform is rolled back, and one of the side ones is rolled in front of it to take its place. Sometimes the side platforms are only half size and each contains only half of the scenery. In this case, both platforms are moved in together and they fasten together to form one complete scene.

Where the script calls for more scenes than there are platforms, stagehands remove the settings from the idle platforms and replace them with the new scenes, while the performers

Continued

## The Mechanix of Gypsy Rose Lee

are acting on the other platform. Sometimes it isn't even necessary to remove a set in order to substitute another. In Uncle Harry, a play utilizing the "jack-knife" change, one of the platforms contains a living room set. During the performance, an office set is put up on this platform *within* the living room set, thus making it a shallower set, but leaving the living room scene intact!

In order to facilitate the rolling of these heavy platforms, tracks must be laid down for the casters to roll on. These usually consist of flat strips of heavy fibre, hundreds of pieces being screwed down directly to the stage floor as needed. As the stagehands push the platforms over these tracks, they have to be careful not to exert too much effort on one side and too little on the other. Once, during a performance of a currently popular show, the platform jumped the fibre tracks and precious time and elbow grease were expended in jockeying the thing back on again.

One ingenious mechanic, Abe Kurnit, head carpenter at the Theater Guild, dissatisfied with the fibre tracks, went to work and designed a set of portable wooden tracks which have proved so successful that defense plants have been contacting him in an effort to adapt his tracks to their industries!

His tracks are made in sections which are laid out on the floor and pin-hinged together, the job taking only 1½ hours as against 6 hours for the fibre tracks. Three to four dozen screws are all that are needed to hold them down, while it takes 10 gross screws and almost as many blisters to fasten down the fibre tracks! Grooved guides along the edges keep the platforms in place and permit such ease in moving them, that only two or three men are needed to pull a platform weighing from 3,000 to 4,000 pounds, as against 7 or 8 men tugging at a platform on fibre tracks.

All this time and energy saving has proved extremely valuable, particularly since war conditions have made traveling facilities so unreliable. Once, when the show, The Russian People, coming back from tour, was scheduled to open in New York for a preview at 8:40 that night, the train was four hours late. With only seven hours left to unload about ten truckloads of equipment, lay out the

When floor space is needed, bulky props are hoisted into the air. Rigidly inspected block and tackle rigs do this job.

Keep your eyes on the maze of ropes in this picture. They control the sets and drops for Star and Garter. Note girls among ropes.

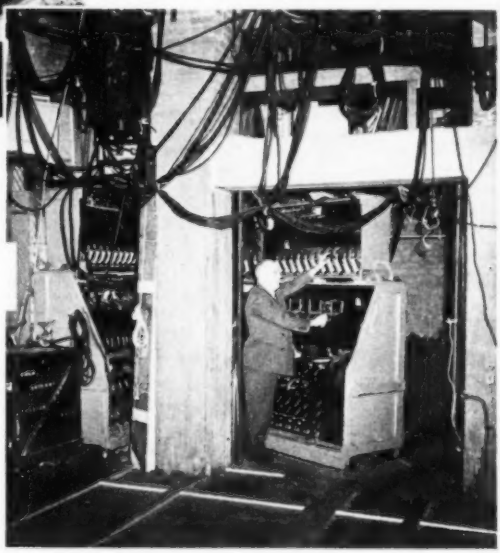
Look carefully, and you'll see electrician adjusting angles of a few of the lights used in Star and Garter.

tracks, assemble the platforms, and put up the scenes and lighting, it looked as though the audience would have to be given back their money and sent home. However, Kurnit's tracks saved the day, and the show opened on schedule. Fibre tracks would have taken at least six hours alone, to lay down, and the show could never have opened on time.

The speed with which the Kurnit tracks permit scene changes is phenomenal. During the show, The World We Make, a doctor's office scene was changed to a laundry, operating full blast, with steam up, mangles, ironers, and washing machines working, all in 30 seconds! In the show, They Shall Not Die, a bedroom scene was changed in 24 seconds to a large courtroom with 50 people, judge, jury, witnesses, lawyers, all seated or standing in place!

Musical shows, as a rule, do not utilize rolling platforms, since they generally have more scene changes, many of which take up the entire stage. Their sets consist mostly of bulk, large pieces that have to be set in place by hand or lowered by ropes. In Something for the Boys, a large western house, complete with veranda, is rolled out onto the stage, its base being fitted with casters. In another scene, a transport plane cabin, with wall cut away to show the people seated inside, is built on a rolling base in such a manner that it can be rocked and swayed from behind the scenes to simulate rough flying.

The long, raised platforms and sloped runways along which the chorus girls of Star and Garter dance, are made up in sections, which are laid end to end and hooked together. The cross-bracing underneath is effectively concealed by decorative panels placed along the sides facing the audience. Most of these runways and platforms come apart, fold and store flat against the back wall, while other large pieces have to be hoisted up into the air when not needed to provide more floor space. Most of the hanging



Portable switch boards like this travel with shows on the road. Highly complex, they control lighting effects of performance.

props and drops are counterbalanced with metal weights to make raising and lowering easy.

The construction of walls and scenery is simple. They consist of linen, stretched over wooden frames, and painted with water colors. They are made light and strong, but occasionally one may accidentally fall against something and tear. They are immediately patched together temporarily until the show is over, then repaired permanently before the next performance.

An average set [*Continued on page 145*]

# . . . but here is one worry you can avoid

THIS war has changed fashions in *driving* as well as fashions in clothes. Today, you use your car less . . . make shorter, more infrequent trips.

This means that water and sludge can accumulate in the crankcase . . . pistons and bearings may be exposed to rust; scale and rust can ruin your radiator; tires and battery may deteriorate and wear out faster.

That's why, today, there is more reason than ever before to protect *your* car with Marfak 40-point Chassis Lubrication Service. This thorough, stem-to-stern service leaves nothing to guesswork. It guards vital, irreplaceable parts, helps keep your car working in tip-top shape.

Remember, Uncle Sam *needs* your car on the job. So instead of *worrying* about possible breakdowns, guard against them by insisting on genuine Marfak Lubrication Service. At Texaco and other good dealers everywhere.

**TUNE IN:** FRED ALLEN every Sunday night. See your local newspaper for time and station

*You're Welcome at* **TEXACO DEALERS**

# DO OUR WAR MACHINES

American tanks advance in Tunisia. Writes Mr. Kluckhohn: "Our Mark IV tanks are better armored than German Mark IV's, although their 75-mm. guns are not so good . . . The German tanks have a lower silhouette and do not provide so big a target."

by Frank L. Kluckhohn

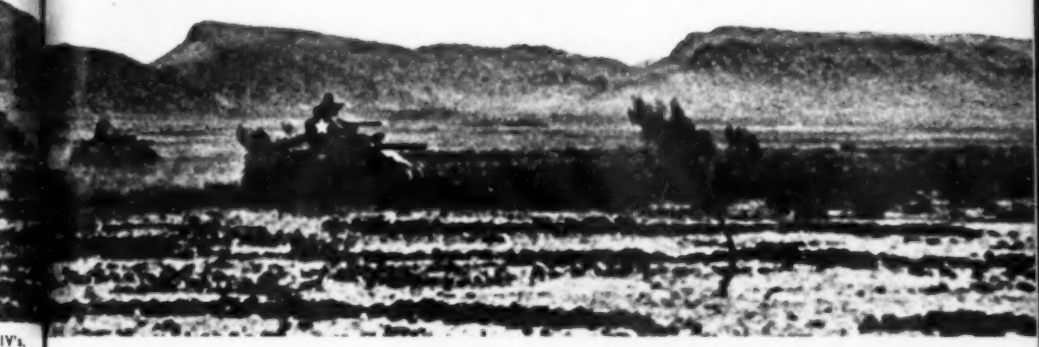
*New York Times Staff Correspondent*

Frank L. Kluckhohn, 35, has been a newspaperman in this country and abroad for 15 years. A native of St. Paul, he attended the University of Minnesota to study law, but gave it up and left college. After some experience in business he went to work for the St. Paul Dispatch. Later, as a wandering reporter, for the Boston Globe he covered most of Europe, as far East as Turkey, before joining the staff of the New York Times nearly 13 years ago. Since then he has served in Washington and Mexico, at the Hague Conference, and for several years in Spain, where he covered the revolutions leading to the Civil War, and part of the Civil War itself. Just before going with the American Army to North Africa, he was stationed in England for the New York Times, by whose permission this eyewitness report is reprinted.

ALLIED HEADQUARTERS IN NORTH AFRICA.—To some extent this North African campaign has been the same sort of testing ground for the Americans that Spain was for the Germans. The lessons learned here can be of inestimable value in future and larger-scale movements. Failure to observe them will certainly lead to an unnecessary expenditure of lives and materiel, if not to serious trouble, in bigger campaigns.

The first of these lessons is that the Americans must work together in large units. Dispersing the available forces over large areas rather than maintaining them in striking form is likely to prove unfortunate. But in armaments and technique—fields that may

# MEET THE TEST?



seem dull but that have the utmost importance in winning battles and saving lives—lessons almost as important have been learned.

It is significant that in the test of weapons and men during the past campaign of more than a month, we won against the Germans and Italians. Generally, the results were satisfactory from our viewpoint. But we were weak in certain details, and these must be corrected. It was definitely proved that our heavy artillery and our method of employing it were superior to the enemy's. Our 155-mm. and 105-mm. guns, both field pieces and howitzers, are as good as any implements that the Germans have, and our accuracy of fire is definitely higher.

Our light arms are better than those of the Germans. They have one machine gun of slightly larger caliber than ours, capable of more rapid fire. But they get no advantage from this, since they go in for impressive bursts of fire, rather than effective shooting, and as a result, since our rapid-fire rifles and carbines are superior and our accuracy is greater, we overmatch them in the light-arms field.

But in the intermediate field they have a decided advantage. Their 88-mm. gun is an excellent special-purpose gun. The Germans now possess a 75-mm. field gun with a very high muzzle velocity. Thus its range and hitting power are better than ours. This has proved of little advantage to them in tank warfare, where maneuverability counts and tricks are important. The more experienced tank units are able to offset the superior muzzle velocity of the German tank guns, but, when the field artillery units equipped with 75s get into action, it is another matter.

U. S. Antiaircraft guns prepare to go into action, *below* during the American counterattack near Sened, on the warning that Nazi fighter planes are on their way to launch a strafing attack. Car scurrying across field at *left* belongs to the Medical Corps.

Blazing Nazi tank, *above*, pays penalty for poor armor. Note American soldier advancing cautiously at left with submachine gun at the ready.

American soldiers learned their battle lessons fast. *Above*, three of them pass a shattered German tank in counterattack which recovered Kasserine Pass.

Because of shipping difficulties we have used the 37-mm. anti-tank guns in this theater. This is a good gun for use in entrenched positions with artillery protection behind, and, if possible, for hitting the sides rather than the front of the enemy tanks. I have seen these guns, dug in behind rises, get effects against the enemy at point-blank range. But when matched against the enemy's heavier anti-tank weapons or at long range against tanks advancing head-on, they are useless.

Our Mark IV tanks, called General Shermans by the British, are better armored than the German Mark IVs, although their 75-mm. guns are not so good as the same weapon on the German tanks. I have seen burned German tanks and been amazed that such heavy guns should be put behind such relatively poor armor. I think that the "edge" is in favor of the United States mediums. On the other hand, the German tanks, like the British, have a much lower silhouette than ours and do not provide so big a target.

Most laymen have a picture of tanks plunging ahead at high speed through gaps in a line or moving forward against enemy tanks in turn advancing against them. Nothing could be farther from the truth. Tanks fire only when standing still and are most useful when providing a close-range artillery barrage. The game—no longer a secret to either side—is never to advance against entrenched artillery but to make the enemy do so by various means that may not be disclosed.

This means, in brief, that the infantry is still the queen of the battle. Tanks, like airplanes, can create breaches and provide cover. But only the infantry can exploit the advantage.

There is still considerable argument to the effect that the Allied system of attacking Axis shipping, airfields, supply dumps and rear columns by air reduces the enemy's effectiveness to a greater extent than do airplane attacks on the front itself. But the fact remains that dive-bombing tends to demoralize the ground forces, as does strafing. I have seen an infantry attack delayed for a critical day, not by the moral effect but because of sheer inability to get into position. From observation I am convinced that the enemy attacks can be broken up by direct attack from the air—it has been done to us.

In ground-air co-ordination, partly because of superior communications and partly because of their recognition of its importance, the Germans are better than we.

Our bombers—Flying Fortresses, Douglas A-20s and other types—are both better and more numerous [*Continued on page* 151]

# WHAT IS AN OFFICER?

by Major Malcolm Wheeler-Nicholson

LT. JOHN JONES, his freshly gold-plated shoulder bars gleaming in the sun, strode down the company street, his chest puffed out like a pigeon, his eyes furtively on the lookout for someone to salute his grandeur.

"Another 90-day wonder," snorted a PFC.

"Phooey on looeys!" said a second.

A third GI wrinkled his nose and said, "Say, what the heck does an officer think he is, anyway?"

It was a fair question. Down through the ages, buck privates—and civilians, as well—have been asking that question: "Just what *is* an officer, anyway?"

The answer, to the untutored, is rather surprising. For investigation shows that a good combat officer is a lot of many things and a little bit of almost everything.

According to old battle pictures of the Civil War, an officer was a gold-braided dandy whose principal job appeared to be to wave his sword in the direction of the enemy—this despite the fact that the enemy was in plain view shooting the living daylights out of all and sundry.

Today, however, such a picture is far from the truth. Here are a few of the things that a good combat officer must be: diplomat, engineer, father confessor, bookkeeper and administrator, food and sanitation specialist,

Public relations? Yes, that's one of the great variety of subjects with which an officer must be acquainted.

mathematician, expert showman, tactician, psychologist, organization and personnel expert, mechanic, ballistics and ordnance expert, lawyer, communications expert and a natural leader of men. And that is only a partial list of an officer's requirements.

It's a military adage that the best soldiers in the world cannot win a battle under an unskilled officer. Daniel Defoe hit the nail on the head when he said, "Better an army of sheep led by a lion than an army of lions led by a sheep."

The rookie may scoff at his second looey in training camp, but when he gets into actual combat his attitude toward his officer will undergo a sudden revision. When the bullets start whistling, the enlisted man soon discovers that his very life depends upon such skill as his superior officer has.

An officer's duties may be divided into three general categories: 1. He must train his men efficiently to fight as individuals and as members of a combat team; 2. He must get his men to the field of battle well equipped, well fed, with high morale and at the peak of physical condition; and, 3. He must use his men in battle in the most skilled fashion to destroy the morale, break the cohesion and drive before them the shattered remnants of the enemy.

The skill to achieve this, at least cost in casualties, while exacting the greatest cost in enemy dead, wounded and captured, is first of all gained in the soldier training period. It is here that the qualities of an officer are first put to the test. Let us take our average lieutenant, John Jones, just graduated from Officers Candidate School and landed, all spraddled out with a brand new uniform and a pair of shiny, new, gold-plated shoulder bars, in command of real live soldiers. No matter where Johnny Jones came from (and the chances are that he was going to high school and supporting a Model "T" by delivering groceries after hours a few short months ago), he is bound to be thrilled by the

Continued

## What Is An Officer?

In today's army, an officer is democratic. General Hanford McNider heads a chow line here.

fact that men rise and stand at attention when he is present, that they are required to salute him and that they use the respectful "sir" in addressing him. If he's made of the wrong stuff the brand new lieutenant will come to believe that he deserves all this.

I, personally, will never forget the first time I ventured abroad wearing my shiny second lieutenant's bars. My mother was walking with me. A private tried to slide by without saluting me. I halted him and gave him a terrific dressing down. When I had completed my tirade, my mother—who had been silent up to this time—turned sternly on me and spoke, with the private listening:

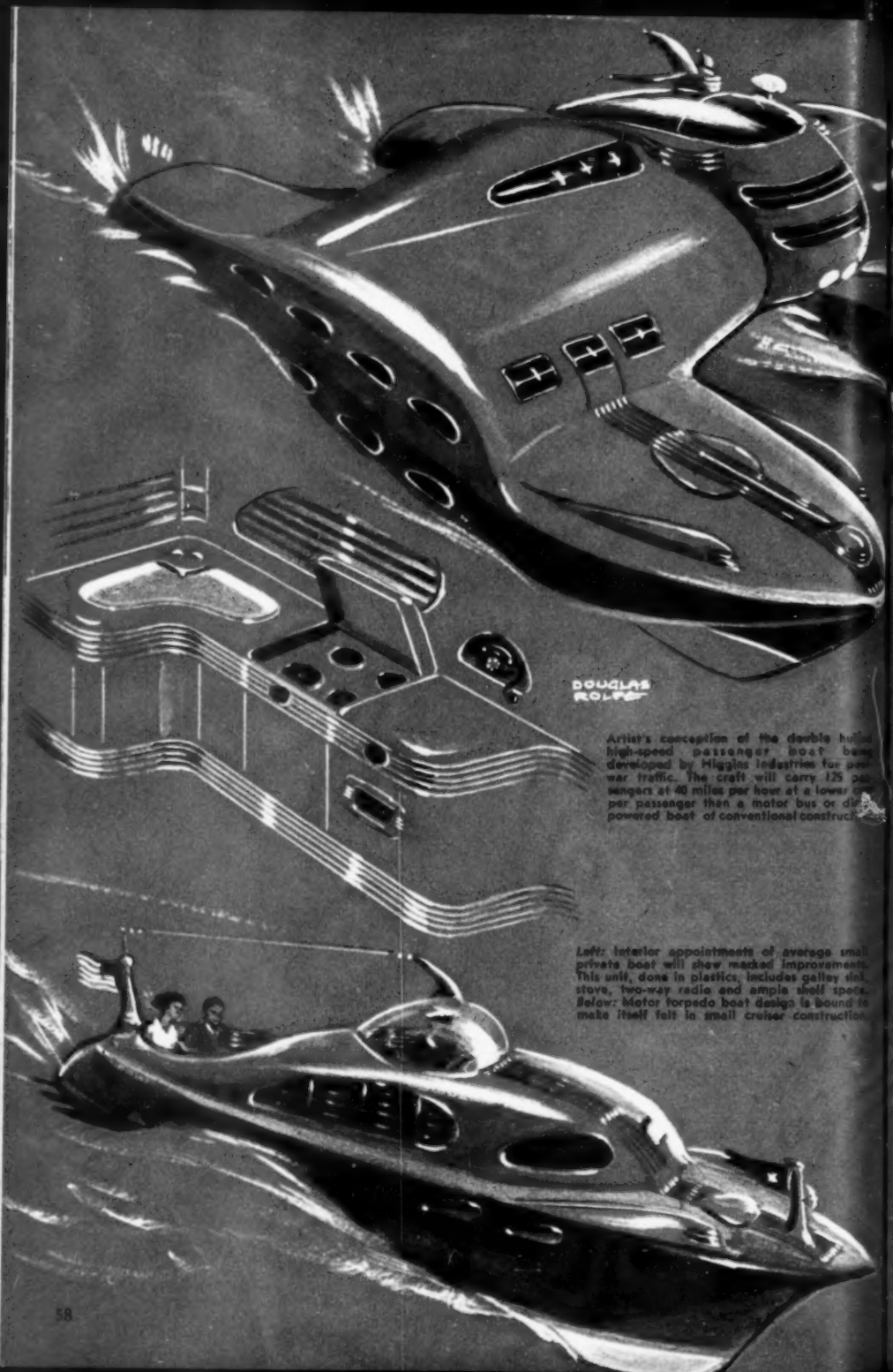
"Son," she said, "was that *necessary?*"

If our Johnny Jones is made of the right stuff, he will grow humble at the thought of his responsibility, without having to be reminded of it by his mother.

For our Lt. John Jones will soon discover that he has a powerful lot to learn if he is to be an officer.

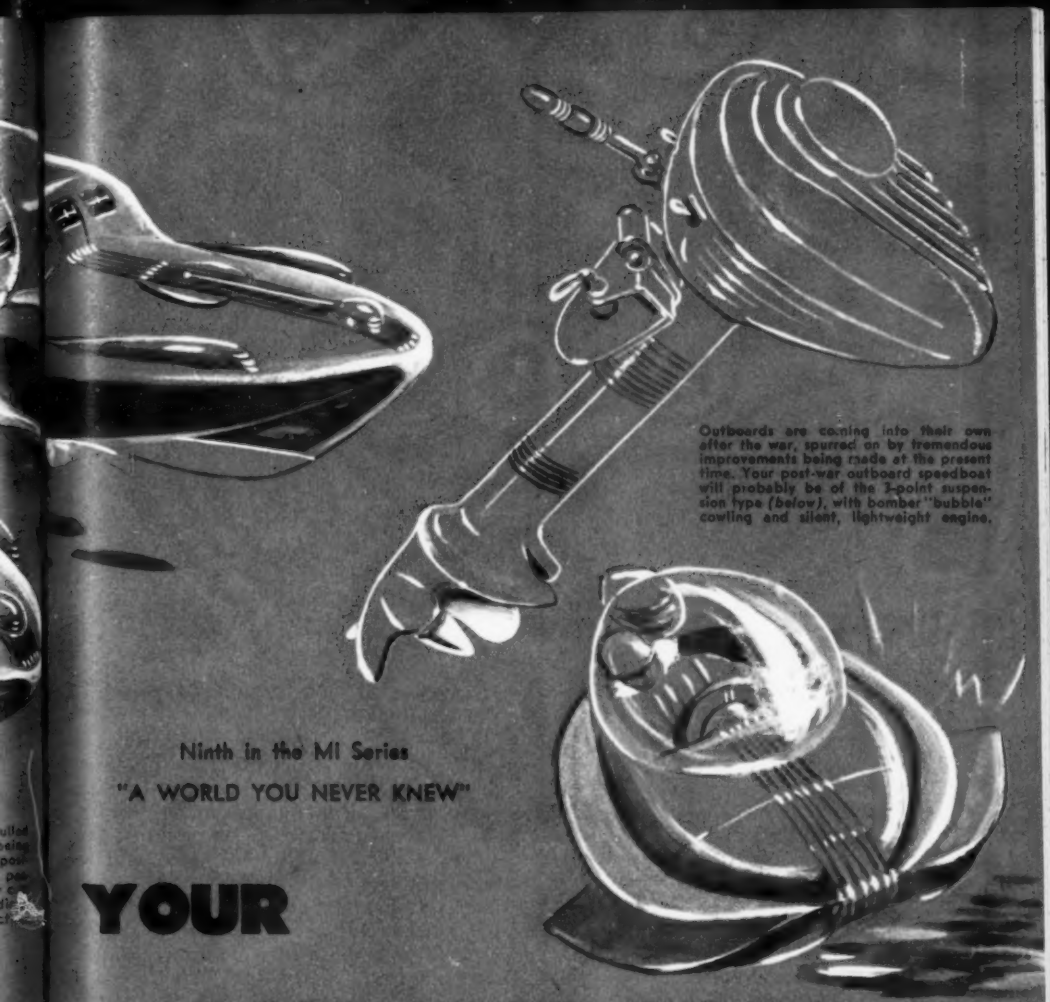
An officer must be a father confessor and a comforter to his men. Here an American officer comforts a wounded soldier at a Tunisian roadside.

On the health side he finds that he has to be a good sanitation specialist, knowing the proper construction and location of latrines and kitchens, and the drainage, exposure and maintenance of shelter in camp and bivouac. He has to be somewhat of a diagnostician, able to distinguish [*Continued on page* 156]




Artist's conception of the double hulled high-speed passenger boat being developed by Higgins Industries for post-war traffic. The craft will carry 125 passengers at 40 miles per hour at a lower cost per passenger than a motor bus or diesel-powered boat of conventional construction.

*Left:* Interior appointments of average small private boat will show marked improvements. This unit, done in plastics, includes galley sink, stove, two-way radio and ample shelf space. *Below:* Motor torpedo boat design is bound to make itself felt in small cruiser construction.



Outboards are coming into their own after the war, spurred on by tremendous improvements being made at the present time. Your post-war outboard speedboat will probably be of the 3-point suspension type *(below)*, with bomber "bubble" cowling and silent, lightweight engine.

Ninth in the MI Series

"A WORLD YOU NEVER KNEW"

# YOUR POST-WAR BOAT

by Roland Cueva

IT'S the summer following the unconditional surrender of the Axis to the victorious armies of the United Nations. The war has been over for eight months, and you're enjoying your first real vacation in almost three years. You drive toward the beach with a light heart, new synthetic tires and a tank full of unrationed gas. In the back are your kids and fishing tackle, beside you the wife who waited patiently and prayingly through all the dark hours while bombs and shells were shaking the ground under your feet and molding the substance of her dreams. You've never felt happier in your life, and you can hardly wait the fifteen minutes needed to span the twenty-odd miles to the beach via the new express highway.

Newest wrinkle in modern mechanized warfare is the amphibian jeep, shown above during trials in the Detroit River. With four wheel drive, the jeeps can travel with equal facility on land or water. They are the forerunners of a new type of transportation sure to come after the war, and may represent a preview of your own post-war boat.

"Did you remember to get a weather report?" says the little woman.

You'd forgotten, but there's nothing to it. Reaching forward, you flip the dashboard radio switch to *telephone* and get a detailed report direct from the nearest Coast Guard Station. Fair and warm with light S.W. winds all week, they say, except Wednesday when there'll be a brief shower about 4 p. m.

The remaining eleven minutes go fast, and the ramp across the beach appears ahead. You drive over it and— "Hey, mister, what are you doing? Stop, you're driving right into the water! You'll be wrecked, killed, drowned, you'll—"

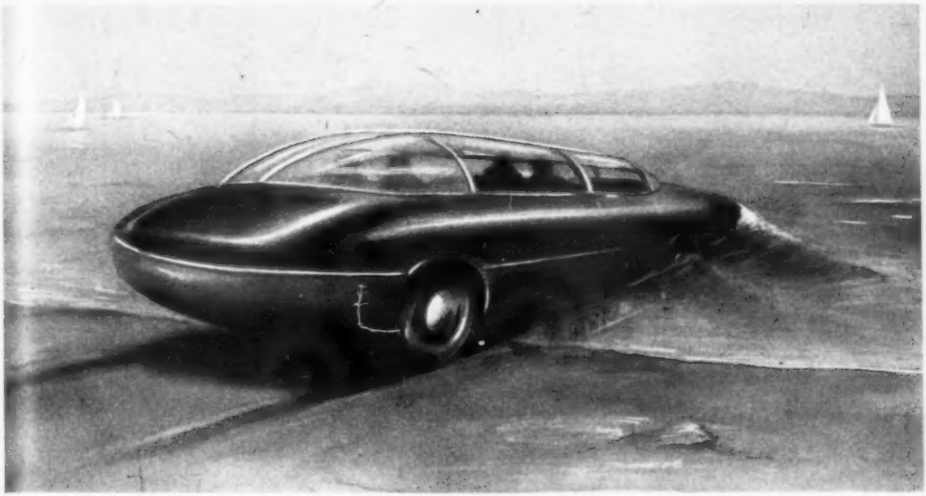
"Take it easy, chum, nothing is going to happen. We're just goin' fishin'. This is our new amphibious peacetime jeep . . . it's *supposed* to go in the water. See those other fellows out there? They all have 'em too. You just drive right down into the waves, shift from wheel drive to 'prop,' and there you are, riding like a duck. They'll make ten knots, and they're really seaworthy, though of course you want to head for shore if a bad line squall comes up. That's another beautiful point about these jobs. You don't have to anchor and sit out the blow, hoping your ground tackle will hold. You just drive ashore and go home."

In the light of today's mechanical and scientific war developments, there's nothing exaggerated about the foregoing picture, except, perhaps, the miraculous weather report. There's no reason to suppose that boat design will stand still while land and air transportation forge ahead, even though water-borne craft are bounded by more stringent natural laws than the other two, particularly in the matter of surface friction. Boats can never hope to attain the speed of airplanes or automobiles, though certain racing craft have done better than 100 m.p.h. in calm water, and the remarkable PT boats can make time even under adverse weather conditions.

But these are specialized cases, and it is an axiom of naval architecture, as in life itself, that you can't have your cake and eat it. Where something is gained in boat and ship designing, something else is invariably lost. Actually, there's no reason why boats *should* have excessive speed built into them, for their value lies in other directions, and the post-war speed addict had best take to the air. This doesn't necessarily mean that the speeds of various types of vessels will remain at pre-war levels, with the possible exception of heavy cargo ships, where economy of transportation is the principal factor, and high speed too costly. Your post-war power

**Continued**

## Your Post-War Boat



When you want to go boating after the war you may just drive your peacetime jeep down to the beach and right on into the water. Think of the toll bridge money you'll be able to save when driving across country!

Out of water the amphibian jeep looks like this. The "bilge" has ample road clearance, a paradox come true. A winch on deck aids in climbing out of the water up steep banks. No hauling out or mooring problems with one of these!

cruiser, for instance, influenced by motor torpedo boat design, built of lighter materials and driven by a lighter, more powerful engine will undoubtedly average ten or fifteen knots faster than today's equivalent.

Streamlining, so vital at 300 m.p.h. means little at 30, and in the case of boats, can only be applied to the superstructure, the area where skin friction is of least importance. It is true that fish are streamlined, and so are submersibles, but the underwater shape of surface craft represents an entirely different problem and is governed by considerations of bouyancy, stability and intended purpose of the boat.

An example of this would be a medium-sized fast passenger and cargo vessel. The sharp bow must co-operate with the engines to break a path through the waves with maximum efficiency. The bilge, or central portion must be full enough to provide ample space inside the ship, keep it stable and yet allow the water to flow past with a minimum of friction. The stern must be shaped to lift easily to following seas, decrease "drag" and must also provide the mighty propellers with an uninterrupted torrent of nonturbulent water. Right here is where the ship's performance is determined. Whether the topsides look like a teardrop or a boxcar makes little difference, except in eye appeal. These are facts which will hold just as much after the war as now. There will be certain

MECHANIX ILLUSTRATED wishes to express its sincere thanks to the following naval architects, designers and boat and yacht corporations for their co-operation and assistance in gathering material for this article:

Mr. Frank Pembroke Huckins: The Huckins Yacht Corporation, Jacksonville, Fla.
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Mr. W. S. Pickell, Chris-Craft Corporation, Algonac, Mich.
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Mr. William Atkin, Naval Architect, Darien, Conn.
Mr. Walton Hubbard, Jr., Hubbard's South Coast Company, Newport Beach, Calif.
Mr. J. Murray Watts, Naval Architect, Philadelphia, Pa.

Wartime tank-landing barges can be adapted for river and lake transport, eliminating dock and warehouse facilities. Here one portages a falls.

Continued

## Your Post-War Boat

exceptions—craft designed for specific purposes (see illustrations) but generally speaking the principal improvements in cargo and passenger vessels will be in freight handling equipment and accommodations. Smaller ships will be the rule. The huge uneconomic super luxury liner is almost certain to vanish from the seas and join the sailing ship in oblivion.

In the field of pleasure boats the picture is somewhat different. Here economic and weight-carrying problems are of less importance, consequently, far greater freedom of hull design and construction materials is possible. There seems little doubt that many of the sail and power boats dotting our lakes, rivers and bays will be startling, if measured by present standards.

Two tank-landing vessels, *above*, land material directly on the shore. Such vessels can be used for peacetime operations as shown on *opposite* page.

The amphibious jeep mentioned a while ago is one example, and has its counterpart in the new amphibian of the same name being built in large numbers for the Army. But maybe you won't want a boat that makes like an automobile. All right, how about a non-magnetic cabin cruiser that will never have to be caulked or painted; that's rot proof, corrosion proof and worm proof, making 45 knots with an engine no bigger than the auto-conversion in your present boat? And we'll throw in a two way radiophone to boot.

This is no fantasy, and furthermore, such a boat will probably cost *less* than the one you have now. It won't be done with mirrors, but with modern plastics, metal alloys, plywood and other materials from the miracle-laboratories of science. Your cruiser will be molded or planked with tough, phenolic-resin bonded plywood, surfaced with resilient plastic in any desired color. This plastic will be highly resistant to scratching or other contact damage, but should such occur will be easily repairable. It will have a smooth, permanently beautiful luster that sun and water will leave undimmed. Under this impervious skin will be a skeleton of light-weight non-corrosive alloy, having strength and longevity unknown to wooden frames. The deck and trunk cabin will also be plastic-faced plywood, or perhaps pure sheet and molded plastic, of a non-skid variety. You won't have to worry about slipping off in wet weather, and you can bang the anchor against topsides and deck to your landlubber heart's content, without fear of damage.

Below, your cruiser will be a thing of beauty and comfort such as you've never dreamed of. Colorful plastics, cleaned by a swish of a damp cloth will replace grimy woodwork, and the galley will be practical as well as attractive. The ship-to-shore radiophone will make it possible for you to get accurate weather reports, or talk to your office. You could even call up your mother-in-law in North Dakota from the middle of Block Island Sound, should you be so inclined.

Under the cockpit floor will repose the processed herd of horses needed to push your boat at high speed. The herd will take the form of a light, compact gasoline or diesel engine having enormous power-to-weight ratio, yet extremely economical in operation. Some such motors have already been developed for the Army and Navy—others are on the drafting boards.

Maybe you're a windjammer enthusiast, or possibly your taste runs to outboards. In both these types of craft, you'll see many changes. Hull shapes for sailboats won't alter

Continued

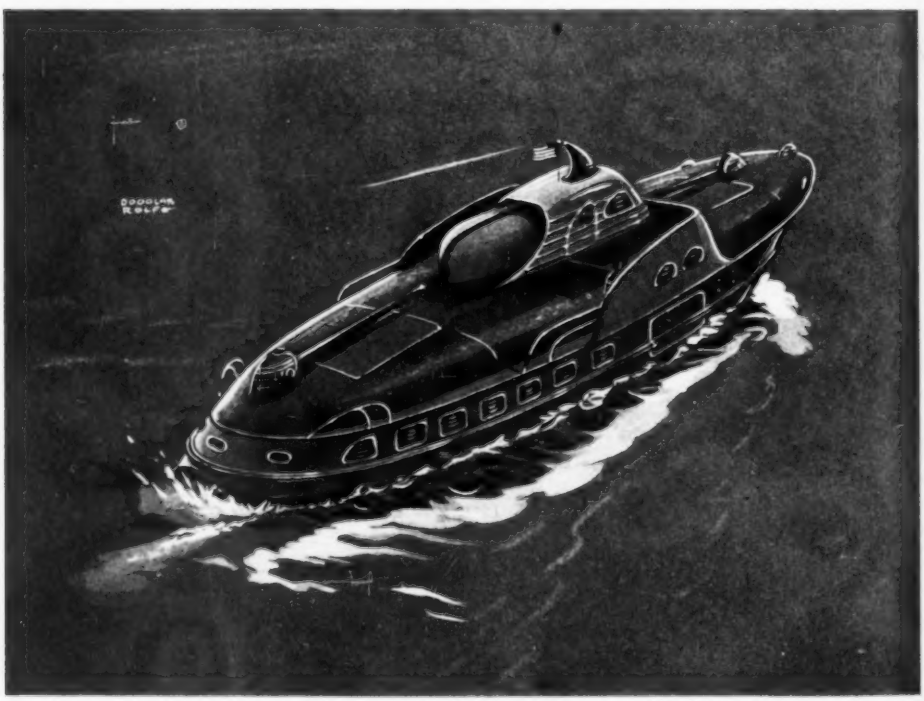
## Your Post-War Boat

much, neither will their sails, for specialization requires them to be about the way they are. But when it comes to rigging and sail *handling* the story will be different. Here again soybeans, synthetics, and the metallurgists come into their own. Cleats, chocks, blocks, bitts, sail track and other fittings will be of high-tension plastic; just as durable and far cheaper than the metal ones in common use today. New stranded stainless alloys of tremendous strength, borrowed from the aviation industry, will take the place of clumsy wire rope rigging. Redesigning of running rigging (the ropes used to handle the sails) will put most of it out of sight inside hollow spars, giving the boat a trimmer appearance and avoiding the dangers of fouling lines in the event of a sudden blow.

Your post-war outboard boat will be something to marvel at, and a long swim from the present noisy putt-putt. Wartime improvements in these motors have been outstanding, and today the Army landing barges, assault boats and other small craft are equipped with outboard motors that are as powerful and silent as softly whirring dynamos. Development of new heat-resistant non-corrosive metals, high octane fuel and quiet, underwater exhausts are principally responsible. When you hitch one of these light-weight cyclones to your 3-point suspension hull you'll really go places in a hurry.

It is in the field of marine engines that many of the most progressive refinements are likely to occur, and they are almost certain to follow the general trend of automobile and aviation engines. For instance, up to now most marine engines built for pleasure craft have had gray iron cylinder heads because salt water is extremely corrosive to the aluminum used in high-compression car motors. The discovery of corrosion-proof dural, beralite and other aluminum and beryllium alloys make this no longer neces-

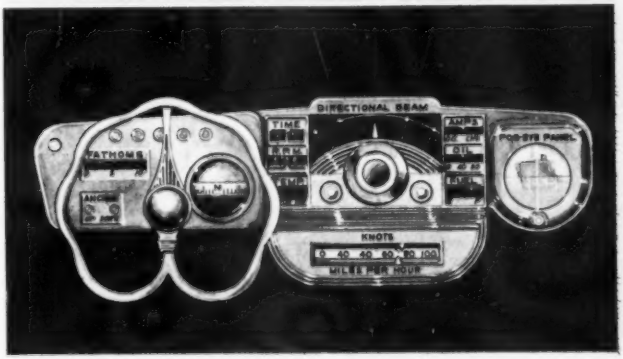
*Below:* An example of specialized post-war boat planning. This craft, an 85-foot passenger and cargo vessel, was designed by J. Murray Watts, N. A., for use on the shallow Mackenzie River in the Canadian Northwest. A gale of wind blows almost continually from the north down the Mackenzie, and boxy stern-wheelers could make little headway against it. Watts' vessel has tunnel stern, is almost perfectly streamlined, with flush hatches and cargo booms. It will operate swiftly and economically.



sary; coupled with high octane gas they will bring small, powerful motors to the boating public.

As a matter of fact, a post-war boat having this type of engine has already been designed for a prominent Mexican by one of America's leading yacht designers and naval architects, J. Murray Watts. The boat, to be built as soon as the war ends, will be 38 feet long, of triple-skin plywood construction. A 12 cylinder supercharged Packard engine delivering 1,500 h.p., and weighing no more than a 150 h.p. pre-war motor will give the cruiser a speed of better than 50 m.p.h. Mr. Watts, incidentally, has been a leader in the development of all metal hulls for small boats, and recently completed a 45-foot yawl of "Birmabright," an aluminum alloy having great tensile strength. She displaced only 12½ tons, as compared to 14 tons for a steel vessel of equal strength.

Post-war power cruiser projected by Chris-Craft. Light, powerful engines and wide employment of durable plastics will be featured in boats like this.




Easy-grip wheel, radio directional beam equipment, depth indicator, automatic anchor haul and fog piercing television device may make the helmsman's task simple in tomorrow's boat, whether he be guiding small pleasure craft or ocean liner.

Diesel engines, heretofore impractical for small craft because of their low power in relation to tremendous size and weight, will finally become available to the little fellows. Great strides in diesels were being made even as the war started, and while progress since has been shielded by the necessity of military secrecy, we can safely guess that when the veil is lifted, results will be astounding. There is no doubt that light, small diesels delivering real power at low initial cost and upkeep will be produced in large quantities. And there is no doubt that the manufacturers will find a good market among the builders and owners of boats in the 30- to 65-foot class.

While we may reasonably expect to see the most spectacular achievements in the realm of specialized design, new materials, engines and "gadgets," the so-called fundamentals will not be neglected. A good many of tomorrow's yachtsmen are today's Naval, Coast Guard and Auxiliary personnel. When they return most of them will not only have boats and salt water in their blood—they'll know a good boat when they see one, and they'll know a bad one too. Beautiful galleys and gewgaws are fine, but they won't be enough. These men will have been trained to the exacting construction standards of the U. S. Navy, and will be able to see right down through all the trimmings in the world to the boat's "vitals." Their minds will be open to sound refinements, of course, but finish will be secondary to ruggedness, seaworthyness, comfort, plus greatly improved mechanical and electrical features.

From the production standpoint, it is doubtful that boats will ever come near the peaks attained by the automobile and aviation industries. It is true that the boating public will probably [*Continued on page* 132]

# HELL 'ROUND THE CLOCK

Flak over Hamburg formed these artistic light patterns, and silhouetted Lancaster bomber taking part in the raid. This photo of 94th R.A.F. visit to the Nazi city, was taken from another Lancaster as incendiaries and 4-ton block busters were dropped.

by Charles J. Rolo

*"You have no chance. Soon we will be coming every night, every day, we and the Americans."—Air Marshal Sir Arthur Harris in a broadcast to the Germans. July 28, 1942.*

SPRING has entered Hitler's Germany with clouds of bombers and a hail of destruction. In the first 40 days of the 1943 bombing season, the threat broadcast to the Germans last summer by Britain's bomber boss, Arthur Harris, was made good with 14,000 tons of bombs from the R.A.F. alone* —a daily *average* one-and-a-half times greater than the Luftwaffe's *heaviest* raid on Britain. By May, the greatest air offensive of the war was well under way.

Its objectives: to "soften up" the continent for invasion; to choke off the U-boat campaign by smashing submarine bases and building yards; to aid Russia by wearing down the Luftwaffe's fighter strength, by disrupting communications, by tearing great holes in the Reich's war production, and by immobilizing 1,000,000 men on anti-aircraft defenses. Its pattern: hell 'round the clock, a non-stop assault on targets from Narvik to North Africa.

By day, key strategic points throughout Hitler-held Europe are picked off by high-flying American Fortresses and Liberators,

* No figures are yet available on the weight of bombs dropped by the U. S. A. A. F. on Europe.

SATURATION BOMBING. Before bombing, Wilhelmshaven looked as in R.A.F. photo at upper *left*. After raid, as at upper *right*. PRECISION BOMBING. U. S. Army bombers show Yankee technique, score a bull's-eye on bridge shown in photo at *right*.

Bostons and Venturas; by the amazing British all-wood Mosquito—the fastest bomber in the world; by nimble Hurricanes and Whirlwinds that dive-bomb their target at point blank range. This daylight offensive strikes with pinpoint precision at railroads, lock-gates, warehouses; the submarine pens at Lorient and St. Nazaire are plastered with bombs; airdromes are wrecked and runways put out of commission; great arsenals go up in smoke.

By night large-scale "saturation" raids are executed by massive Lancasters, Stirlings, and Halifaxes, each carrying a six- to eight-ton bomb load, including 8,000 lb. block busters. A whole section of a city—illuminated by incendiaries and by 50,000,000-candle-power flares—is "saturated" with bombs until everything standing is demolished.

In what is so far only the curtain raiser to the real Battle of Germany 2,000 plants have been destroyed or disabled, and more than 1,000,000 Germans—many of them war

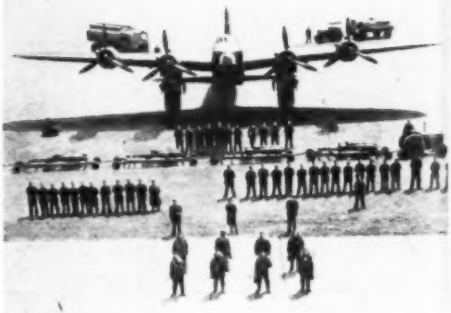
**COSTS OF 1,000-PLANE BOMBER RAIDS**

| | |
|---|---|
| Bomber planes—estimated losses | $11,250,000 |
| Crew training cost, loss | 1,300,000 |
| Gasoline—expended | 375,000 |
| Bombs—expended | 1,000,000 |
| | $13,925,000 |

(Costs such as pay for crews that return, pay for ground personnel, and repair expense of damaged planes that return, are not included.)

According to rough estimates, it costs about $300,000 to build one of the heaviest bombers. Thus a 1,000-plane raid executed by four-engined bombers would represent an original investment of $300,000,000. Add to this the cost of training crews—7,000 men at an average training cost of $4,000 per man—and the total investment jumps to about $328,000,000.

Avro Lancaster takes less time to build than any other heavy bomber, carries 8-ton bomb load. Powered by four Rolls-Royce liquid-cooled Merlins of 1,250 h.p., or air-cooled Bristols of 1,600 h.p. Makes 300 m.p.h., and ranges 2,000 miles with full load, 3,000 miles with part load. Wing span is 102 ft., length 69 ft. 4 in., height 20 ft. Fully loaded, this ship weighs 30 tons. It carries 10 Browning .303 cal. machine guns in four turrets.



Short Stirling. Four Bristols or Wright Cyclones of 1,600 h.p. drive this 7-man bomber. Bomb load is 8 tons, total weight 35 tons, range fully loaded is 2,000 miles. Wing span is 99 ft. 1 in., length 87 ft. 3 in. Height 22 ft. 9 in. This is the largest and heaviest bomber in regular service anywhere in the world. Heavily armored, ship carries 8 machine guns of .303 cal. in three turrets. It carries two rubber dinghies for sea emergency.

workers—have been left homeless. One hundred thirty-six thousand square yards of the famed Krupp munitions works at Essen have been reduced to rubble. The Ruhr industrial area—where the foundries and factories that are the heart of the Nazi war machine lie cheek by jowl for miles—has been showered with bombs of the heaviest caliber night after night. Berlin, home town of the Prussian *Herrenvolk*, has rocked under 8,000-lb. block busters in its fifty-eighth raid of the war. In Italy, seven acres of the dockyards at Genoa, 70 factories in Turin, and part of the submarine works at Spezia have been turned into a shambles by "saturation" bombing tactics.

"Saturation" bombing is one of the few genuine innovations in aerial warfare. The idea behind this form of attack is simply to "saturate" (i.e. overwhelm) the enemy's defenses by sheer weight of numbers. Night defense relies largely on instruments of various kinds. Obviously it becomes more difficult to trace accurately the course of attacking aircraft as their numbers increase. The anti-aircraft batteries can adjust their sights on only a limited number of planes at a time; confronted with a thousand or even with three or four hundred planes they are driven to distraction. Time and again R.A.F. men back from a "saturation" raid have told of German guns firing erratically and searchlights groping frantically about the sky.

Defense against "saturation" tactics is further complicated by the fact that in these large-scale attacks the bombers come in over their targets at different altitudes and from different directions, dropping their bombs in tiers. In the famous Cologne raid, a bomber passed over its target once every six seconds for ninety minutes.

Such concentrated bombing is infinitely more destructive than scattered and sporadic attacks. For one thing—as aerial photographs have shown—one raid by, say, five hundred bombers does considerably more damage than ten raids by fifty bombers. The 1,000-plane raid on Cologne flattened 2,904,000 square yards of the city. In *four* previous raids only 286,000 square yards had been damaged or destroyed.

The damage done is also multiplied by the fact that A.R.P. defenses are completely paralyzed by the intensity of "saturation" attacks. There are too many fires, too many explosions, for the rescue squads and fire brigades to cope with. After a mass attack on the Rhineland one R.A.F. pilot reported that the target looked like a volcano in eruption. During the Cologne raid, the late comers could see the red glow of the city sixty miles away; the navigator of one Halifax thought that a whole forest must be blazing.

The Nazis themselves have labelled these large-scale attacks "terror raids," and a Berlin news-

Continued

## HELL 'ROUND THE CLOCK

Handley Page Halifax. Powered by four 1,175 h.p. Rolls-Royce Merlins, protected from cannon by armor plate. Bomb load is 5½ tons, total weight 27 tons. Range is 3,000 miles. Mid-wing design allows bombs to be stowed in wings. Ship carries crew of 7, and is armed with 8 Browning machine guns. Exhaust flame is reduced by nature of exhaust pipes. What flame does escape is hidden by special cowls set over exhaust pipe outlets.

De Havilland Mosquito. De Havilland's first operational design of the present war, the Mosquito is also first all-wood plane to go into action in World War II. Two Rolls-Royce Merlins drive it 430 m.p.h., and enable it to carry crew of two, and four 500 lb. bombs. Wing span is 54 ft. 2 in., length 40 ft. 9½ in., height over propeller tips 15 ft. 3 in. Mosquito flies as low as 75-foot altitude on raids, outruns Focke-Wulf 190 fighters.

paper has painted this picture of what it feels like to be on the receiving end. "There is no question of sitting or lying in an air-raid shelter reading a paper or playing games. A terror raid is different from that. The air is full of the drone of motors, of the roar of flak, of the whistle and burst of bombs. Night has become day owing to the flames and the flares. Fires rage in the streets. The heat becomes unbearable. Brick dust makes breathing difficult and gets in the eyes, in the throat, in the lungs. Over everything there is biting smoke."

Perhaps the best proof of the effectiveness of "saturation" tactics is the relatively low rate of losses. In last year's large-scale bombings—(figures for 1943 are still secret)—the R.A.F. averaged a 3 to 5 per cent combat loss; a raid is generally considered "successful" if losses are under 10 per cent. Despite the fact that at Essen, Bomber Command challenged the densest concentration of ack-ack batteries and a circle of fighter airdromes, it lost only 35 planes out of 1,036. In an eight-day period beginning with the Cologne raid, the R.A.F. made 7,000 bomber sorties and lost 169 planes—a considerably lower percentage than the Luftwaffe lost during the Battle of Britain—thus confounding the skeptics who had held out against "saturation" tactics. [*Continued on page* 160]

Consolidated Liberator. Long-range heavy bomber powered by four 1,200 h.p. Pratt & Whitney engines, Liberator has a speed in excess of 300 m.p.h. Wing span is 110 ft., length 64 ft., loaded weight approximately 60,000 lbs. Its bomb load is about four tons, and its range more than 3,000 miles. Ship is heavily armored, and armed to cover every angle of attack. Narrow Davis wing makes the Liberator an easy ship to identify.

Boeing Flying Fortress. Douglas and Vega also build these formidable ships. Speed is over 300 m.p.h., ceiling about 40,000 ft. Wing span is 105 ft., length 73 ft., height 15 ft. 6 in. The four 1,200 h.p. Wright Cyclones lift the 30-ton ship with its 2- to 4-ton bomb load. Total of 13 machine guns make up the armament. Normal crew is 11. In one air battle over France, a squadron of Fortresses accounted for 48 Nazi fighter planes.

# "1,000-PLANE-A-DAY" HARRIS

Air Marshal Sir Arthur Travers Harris. "It's up to you to end the war bombings." He broadcast to the German people, "You can overthrow the Nazis, and make peace."

by Charles J. Rolo

WITH the bombing season under way, Air Marshal Sir Arthur Travers Harris, chief of Britain's Bomber Command, and Major General Ira C. Eaker, head of the U. S. Air Forces in Britain, are getting set to unleash against Nazi Germany an aerial offensive that will eventually make the Luftwaffe's Blitz on London look like a hit-and-run affair. "When the storm breaks," Harris predicts, "the Germans will look back to the days of Luebeck, Rostock, and Cologne, as men lost in the raging typhoon think back to the gentle zephyr of the past summer."

"Ginger" Harris—"Bert" to his fellow officers—should know what he is talking about. It was he who blueprinted the 1,000-plane raids on Germany, which U. S. aviation experts hailed as "the first genuine air offensive in history." Harris was placed in charge of Britain's bomber command on February 25, 1942. On March 3, a long spell of bad weather finally ended. That night the R.A.F. blitzed Germany's Paris factories, pulverizing the giant Renault plant. Followed the famous raid in which 6,000,000 pounds of bombs were showered on Cologne, leaving that great industrial city and railroad center looking like the "mouth of hell." Then came other mass attacks on the key strategic cities of the Reich. All this is what Harris modestly refers to as a "gentle zephyr," promising that the real typhoon will come when Anglo-American production hits its peak. To the skeptics who argue that heavy bombing will not win wars, Harris replies: "It hasn't been tried yet." But if "Ginger" Harris has his

way, this summer will see him carry out his threat to scourge the Reich "from end to end."

Arthur Harris is the world's leading exponent of "saturation" bombing. "If we could send 1,000 bombers over Germany every night," he says, "Germany would be whipped in six months"; and he looks forward to the day when the Allies will invade the skies of the Reich with 10,000 planes in one night.

The idea behind these mass attacks is simple: to hurl such a tremendous concentration of bombers against a single strategic area that everything standing is demolished. After the smoke has cleared and photographs have been taken, the bombers return a second, and if necessary a third time, until the target area is literally "wiped out." Harris, explaining the advantages of this wholly new type of aerial warfare, adds facetiously: "If you want the Germans to smell something, you must rub their noses in it."

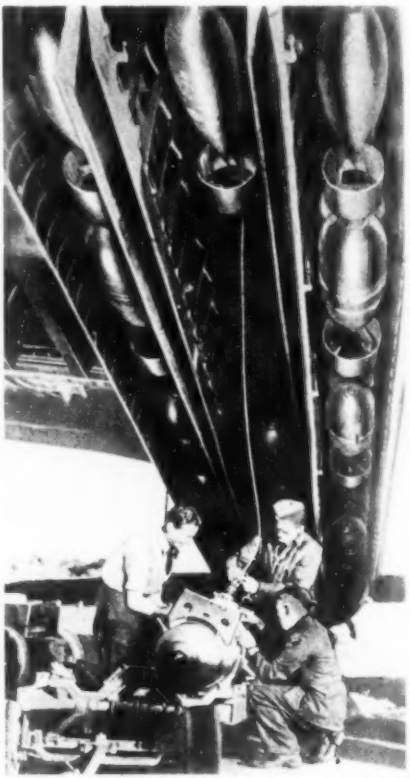
Harris' present headquarters, "somewhere west of London," is so cleverly camouflaged that it appears at first sight to be a hole in the ground. Actually, it is a collection of large, subterranean, bomb-proof offices to which the light of day never filters. Overhead are green fields dotted with bluebells. The "Operations" room is spacious and well-ventilated; lighting is done by fluorescent lamps. The walls are covered with maps. A good part of the floor space is taken up by revolving screens and trestle tables bearing more maps and enlarged photographs. The staff is on duty round the clock, and sleeps in folding camp beds stacked in the corners.

The brain center of the bomber Command is located somewhere under Arthur Harris' size 7½ service cap. Britain's bomber boss, an early starter and a fast worker, reaches his desk at 8:30. First move is a check on the weather reports handed in by the all-important Meteorological officer. Additional weather data come in from Stockholm, Berne, and agents in Germany and the occupied countries. Next Harris scrutinizes the Intelligence reports, picks his target for the night and determines the strength of the force to be sent out. The U-boats are taking a particularly heavy toll of allied shipping, so the Air Marshal decides on a visit to the Goering Mills at Brunswick, which turn out

Here come the Hampdens. This twin-engined Handley Page is used as a mine layer to sow destruction for Nazi surface craft and raiders.

R.A.F. personnel smile knowingly as they rest their elbows on a 4-ton block buster. This, and smaller one at left, head for Nazis.

steel for Hitler's submarines. A telephone call to Intelligence produces most of the information needed about the selected objective: location of plants, photographs of railways, strength of ack-ack defenses, etc. A further call to the Ministry of Economic Warfare serves as a check and perhaps adds further details. Meanwhile, Bomber Headquarters is receiving reports from the individual bomber groups on the number and types of planes available for action that night. At 10 a. m. Harris confers with his senior officer, the chief intelligence officer, photographic officers, and the "Met" (Meteorological Officer). What follows is like the mounting of an immense jig-saw puzzle. Harris' final orders are worked out in detail by his senior air officer and handed to the "controller of operations," who contacts each of the bomber commands and gives them their instructions via broadcast telephone. These instructions, and charts of the best possible route mapped by the Navigation Officer, finally percolate down to the Squadron Leaders on the various fields. In mid-afternoon the crews are called in and given all the information they will need for the night's operations. This is known as "briefing," and winds up with the order to "go out and let them have it right on the chin." A few hours later some key center in the Reich will be catching hell.



Shortly after this photo was taken, these triple bomb racks under a Stirling, dumped load on Ruhr factories.

Bomber boss Harris has been described as "a dynamo of air strategy." A stocky man with thinning red hair and a red hot temper —whence his nickname "Ginger"— Arthur Harris is a crack all-round flier who knows his job from the ground up. In 1915 he was commissioned in the then infant Royal Flying Corps—and has been flying ever since. He has piloted day and night bombers, transports, seaplanes, and flying boats, is an expert gunner and bombardier. Harris' fellow officers have often had occasion to admire his skill as a pilot. One time he flew up to Scotland in a raging gale, and successfully landed his flying boat in a tiny roadstead. The wind was so strong that during the night it lifted the plane clean out of the water and dropped it neatly on the roof of a near-by cottage.

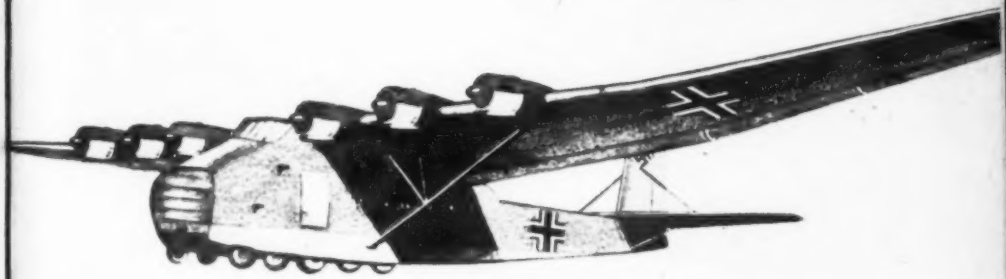
Although his position as chief architect of Britain's bomber offensive involves long hours of desk work, intricate and meticulous planning, Harris at 51 remains essentially a man of action. He has done his best to bridge the widening gap between those who plan and those who execute the operations of aerial warfare. Typical of the Harris way of doing things was his method of finding out just how good were the Polish squadrons flying with the RAF. To the consternation of his aides, the Air Marshal climbed aboard a Polish plane taking off on a dangerous assignment. He came home convinced that the Poles were top notch airmen.

Arthur Harris was born in the sleepy English town of Cheltenham in Gloucestershire, the son of a civil servant. As a boy he was the despair of his teachers. He spent most of his time horseback riding or pottering about in the stables, and at sixteen could hardly write. However, a sudden romance, which flourished mainly by correspondence, left him with a beautiful copper plate handwriting and a momentary enthusiasm for William Shakespeare.

This idyllic interlude was short-lived. At seventeen Arthur was whisked off to Rhodesia, where, so he says: "I did everything that a boy ever wanted to do." He drove trains, shot lions [*Continued on page* 162]

"LUFTWAFFE'S LATEST"

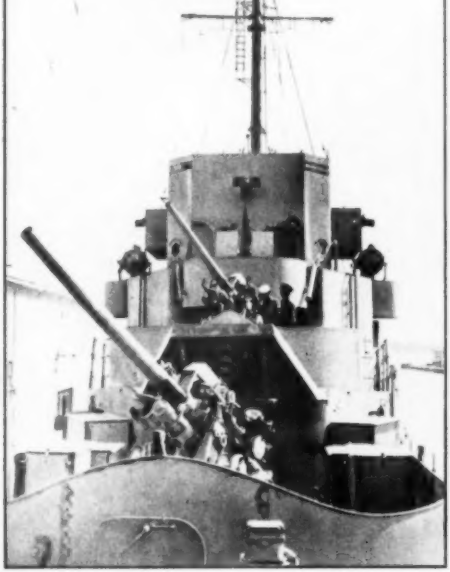
# SCIENCE IN PICTURES

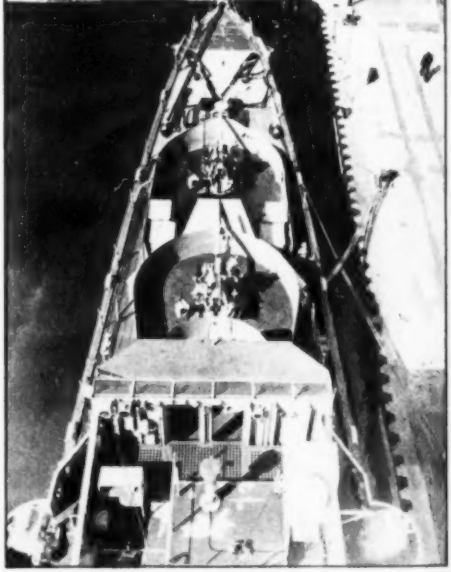


FROM England comes the picture, *above*, of the latest and largest German powered glider, the Messerschmitt 323. Designed to be helped on take-offs by a towplane, the "glider" is powered in flight by six 700-h.p. engines, has a capacity of 11 tons or about 130 men. The two-seater fighter-bomber *below* is the Me-210; though well armed, it has a speed of only about 365 m.p.h., has thus far proved weak in combat.

# "U-BOAT ELIMINATOR"

PICTURED on this page is the U. S. Navy's newest weapon against rattlesnakes of the sea—a destroyer escort vessel designed for the special job of eliminating U-boats. Some 300 feet long, the DE's displace about 1,300 tons, are big enough to be seaworthy in any weather. Slower and less powerful than destroyers, which generally are about 500 tons heavier, the DE's are also much less complicated, easier to build and handle. Note batteries of dual-purpose guns, apparently 5-inchers, for use against enemies either on the surface or in the air. Quantity production of these vessels is now under way.

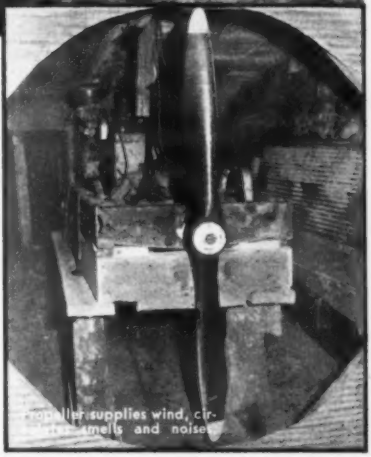




# "LUNK TRAINER"

Entrance to the Trainer looks like an ordinary dugout, gives no hint of the freakish surprises waiting inside.

IN THIS unique hole in the ground staff officers at Fort Leavenworth, Kansas, are tested and trained for battle, as they work out command problems under fiendish conditions. Wax "corpses" startle their eyes, smells and sounds of war blow across them on an unpredictably varying wind to distract them as they fight against time and control their outraged senses. Lunks among them learn to take it—or else.



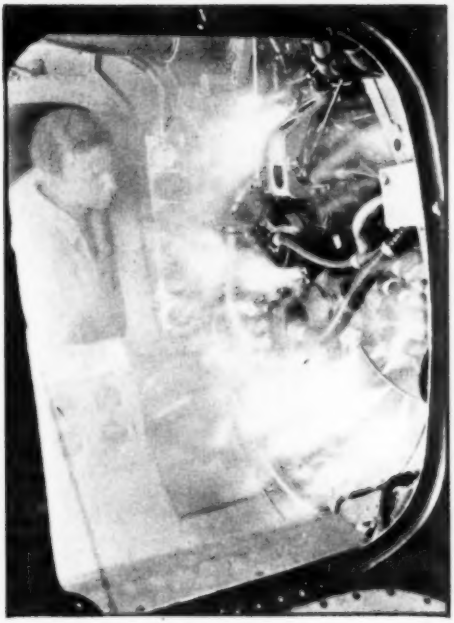
...propeller supplies wind, cir... smells and noises.

Controls and sound equipment create ear-splitting...

Wax dummies in realistic make-up are no help to inexperienced officers working intricate combat problems.

## Gas Bombs For Bugs

IN THE picture *above* a soldier demonstrates one of the Army's newest weapons —a dispenser for a recently developed liquid insecticide fatal to disease-carrying flies and mosquitoes, but harmless to human beings. Equipped with these "bombs" soldiers in tropical climates can protect themselves against insect-borne diseases.



## Fireman At Work

IN THIS picture is shown for the first time what happens in an engine compartment of a Pan American Clipper if fire breaks out. A thermostat warns the pilot of the sudden heat in the compartment by flashing a light; the pilot pulls a switch, which releases into the endangered space carbon dioxide gas, which instantly smothers the blaze.

## Gas Goes To Sea

THE days of cumbersome life-jackets for soldiers on ocean-crossing transports appear to be over, with the development of the life-belt pictured at *left*. Worn as easily as an ordinary wide belt or cartridge belt, the new life-preserver can be inflated in an instant by pressing a valve which releases enough carbon dioxide gas into the belt to enable it to float the heaviest man. Stored under compression in two small attached bullets, the gas upon release expands 450 times.

## Nazis Don't Like It

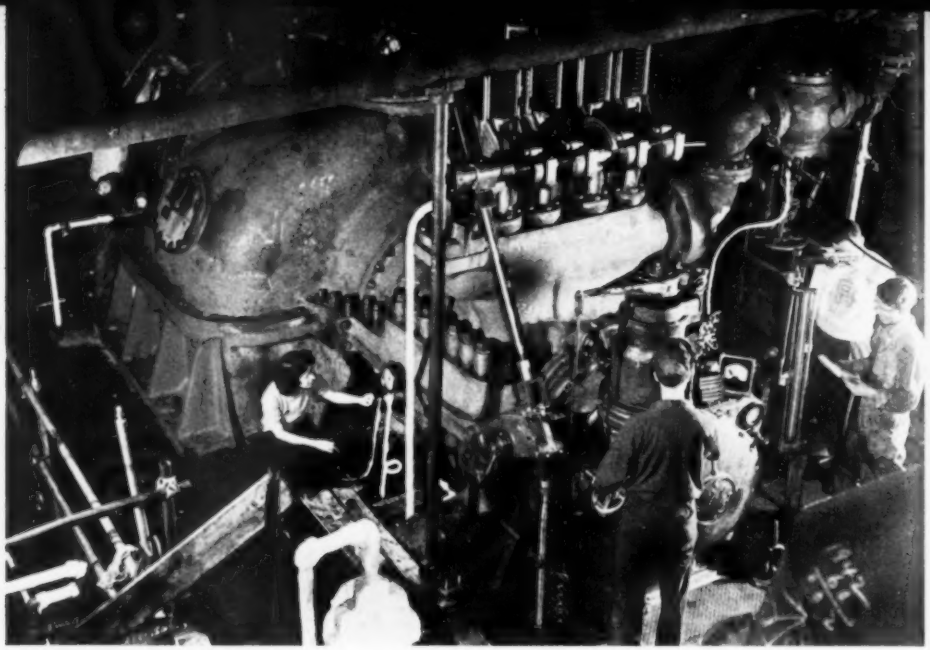
AT RIGHT is pictured the U. S. Army's new tank destroyer—the fast, maneuverable M-10. Details of its speed, armor and armament are still secret, but the Germans have had some personal experience of its wallop in the fighting in Tunisia, and are reported to have found the contact distinctly unpleasant. Note the rounded and angled corners, to deflect shellfire, and the heavy guards at top of caterpillar tread. The top of the swiveled turret is open.

## Artillery's Pride

THE mighty weapon shown at *left* being tested by a crew at Fort Bragg, N. C., is the heaviest portable gun of the Artillery—the new 240-mm. howitzer. Designed for use against heavy installations and emplacements, it can fire a 360-pound shell a distance of 16,000 yards. The big gun, as far as is known, has not yet been put to the supreme test of actual battle, may well make its debut in smashing down the defenses of Hitler's "Fortress Europe."

## Mark VI Necklace

APPARENTLY feeling none too secure even behind the armor of Germany's heaviest tank, the Nazi crew of the Mark VI pictured at *right* rigged pieces of broken track all across its front. It didn't do them any good. The Mark VI, despite its weight of 52 tons, its armament of one 88-mm. gun and two 7.29-mm. machine-guns, proved no match for United Nations tank destroyers such as the M-10 (see above). Note muzzle brake on main gun.

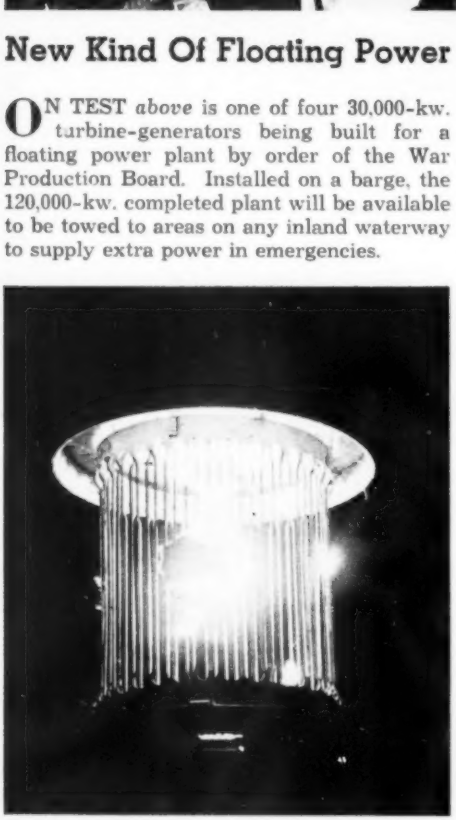


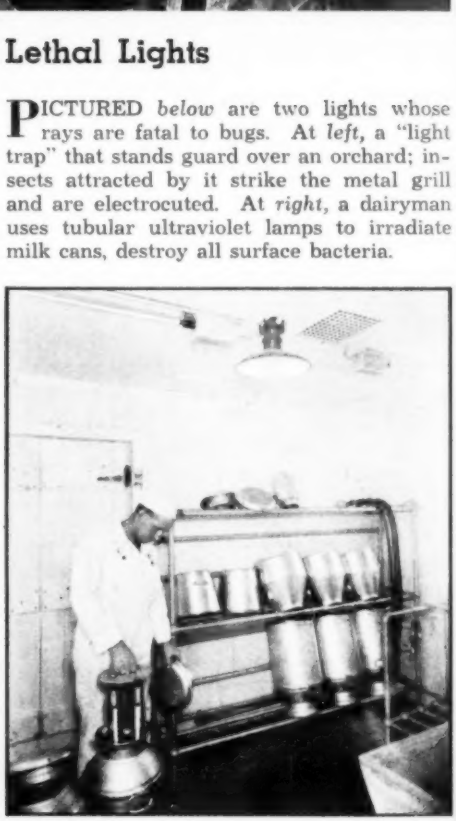
## New Kind Of Floating Power

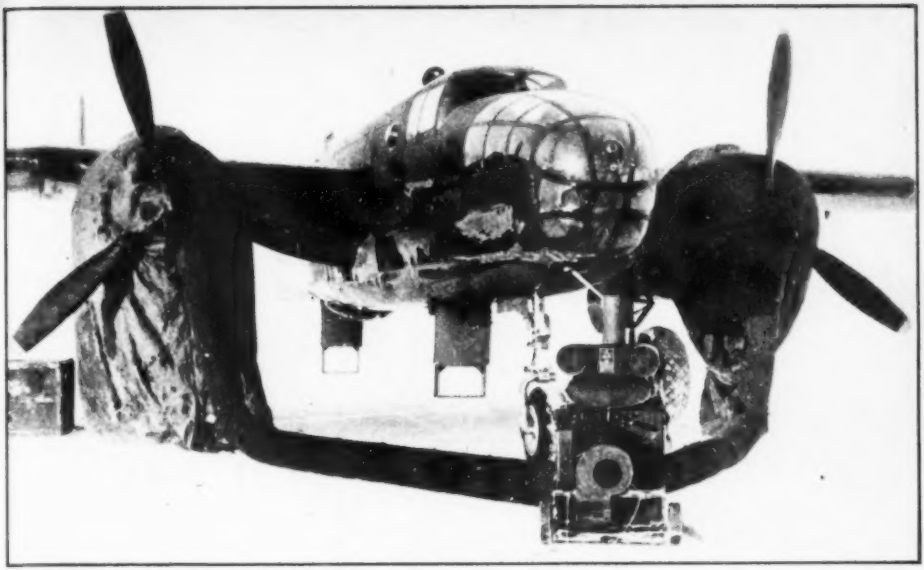
ON TEST *above* is one of four 30,000-kw. turbine-generators being built for a floating power plant by order of the War Production Board. Installed on a barge, the 120,000-kw. completed plant will be available to be towed to areas on any inland waterway to supply extra power in emergencies.

## Lethal Lights

PICTURED *below* are two lights whose rays are fatal to bugs. At *left*, a "light trap" that stands guard over an orchard; insects attracted by it strike the metal grill and are electrocuted. At *right*, a dairyman uses tubular ultraviolet lamps to irradiate milk cans, destroy all surface bacteria.







## Motors Keep Warm In Alaska

WINTER in Alaska is no easier on motors than on men, requires special measures to keep 'em flying. *Above*, a portable heating unit sends warm air to the hooded engines of a B-25 Mitchell bomber of the type regularly used in patrols over U. S. outposts.

## Swimming Artillery

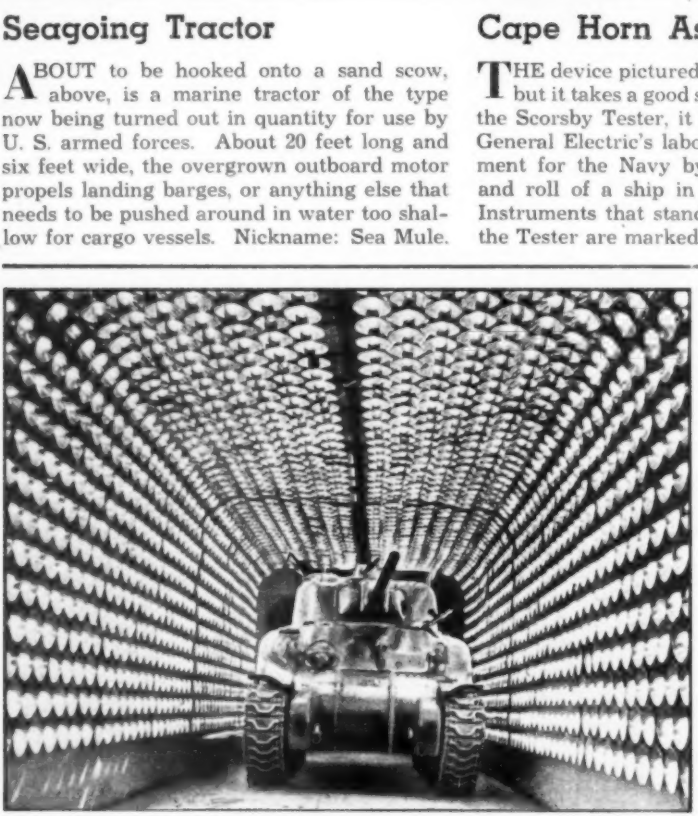
NEVER intended to paddle across rivers under its own power, this British Bren gun carrier, *right*, can nevertheless do it when necessary. Picture was taken during a demonstration by the Royal Engineers, to show effectiveness of their mattress-like floats. *Below*, a field gun makes a similar trip on floats, powered by engineers on shore. Equipment in both cases stood the trip perfectly.

## Seagoing Tractor

ABOUT to be hooked onto a sand scow, above, is a marine tractor of the type now being turned out in quantity for use by U. S. armed forces. About 20 feet long and six feet wide, the overgrown outboard motor propels landing barges, or anything else that needs to be pushed around in water too shallow for cargo vessels. Nickname: Sea Mule.

## Cape Horn Ashore

THE device pictured above isn't seaworthy, but it takes a good sailor to man it. Called the Scorsby Tester, it has been developed at General Electric's laboratories to test equipment for the Navy by simulating the pitch and roll of a ship in any kind of weather. Instruments that stand up on a "voyage" on the Tester are marked O.K. for sea duty.

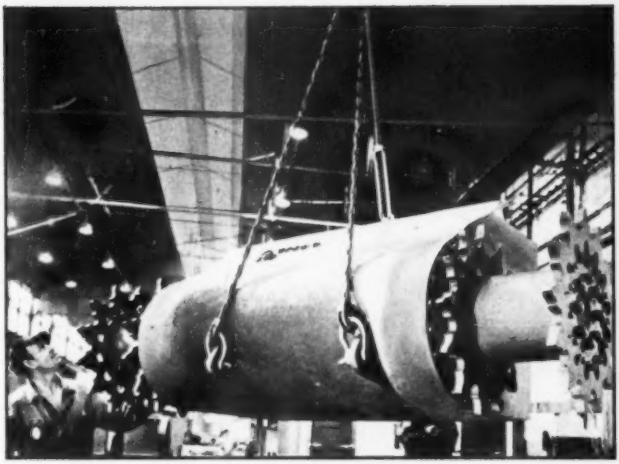


## Short Cut To The Front

PICTURED at left is a tunnel lined with infra-red lamps through which pass freshly-painted tanks at the Chester, Pa., Ordnance Depot of the U. S. Army. Ordinarily, a paint job would take 24 hours to dry; this battery of lamps does the job in just four minutes—so rapidly that the driver doesn't even leave his seat, but keeps the tank on its way to battle.

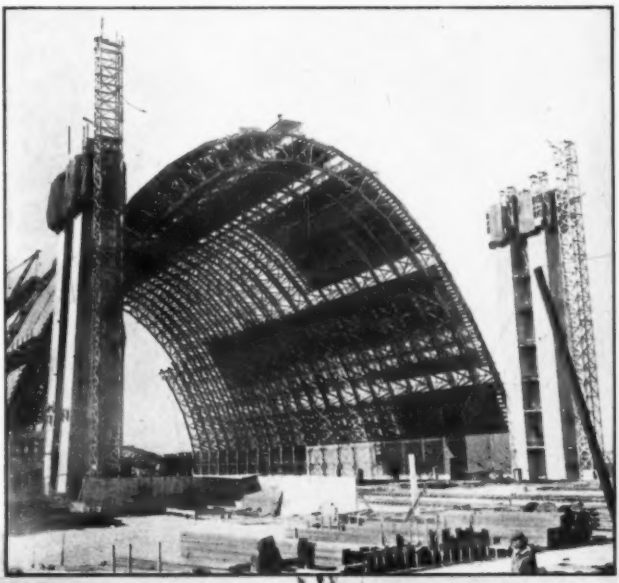
## Drive For Victory

AT RIGHT is the heart of a U. S. tank, being swung into position for installation at the Buick tank plant in Flint, Michigan. It is the transmission and final drive assembly, powerful and tough, but machined to hairbreadth precision, which will give the crew of some Allied tank the speed and maneuverability needed in modern warfare. Subjected in Tunisia to hard battle, sandstorms and desert heat, these transmissions have proved they can take it.



## Bungalows For Blimps

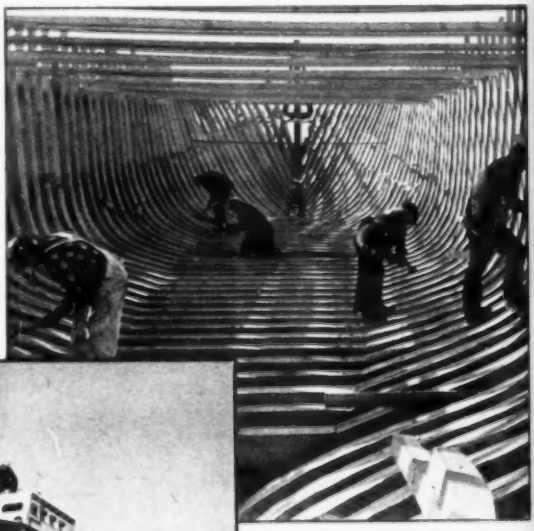
TO SAVE steel badly needed elsewhere, the U. S. Navy's Bureau of Yards and Docks designed these huge hangars of wood, *right* and *below*, to house the fleet of blimps used on offshore U-boat patrol. Nearly 1,000 feet long, 171 feet high and 246 feet across, they include the largest wooden arches ever built, mark the first use of wood instead of steel in large-scale structures. The wood is flame-proofed with a mixture of ammonium and boron salts. Note parabolic shape of arches, tiny figure of workman in picture at *right*.



# WOODEN SHIPS OF WAR

Ribs of a coastal transport, bent to proper shape in a steam-chest, are fitted to the keel. Shipbuilding methods in these yards are almost the same as those used more than 100 years ago.

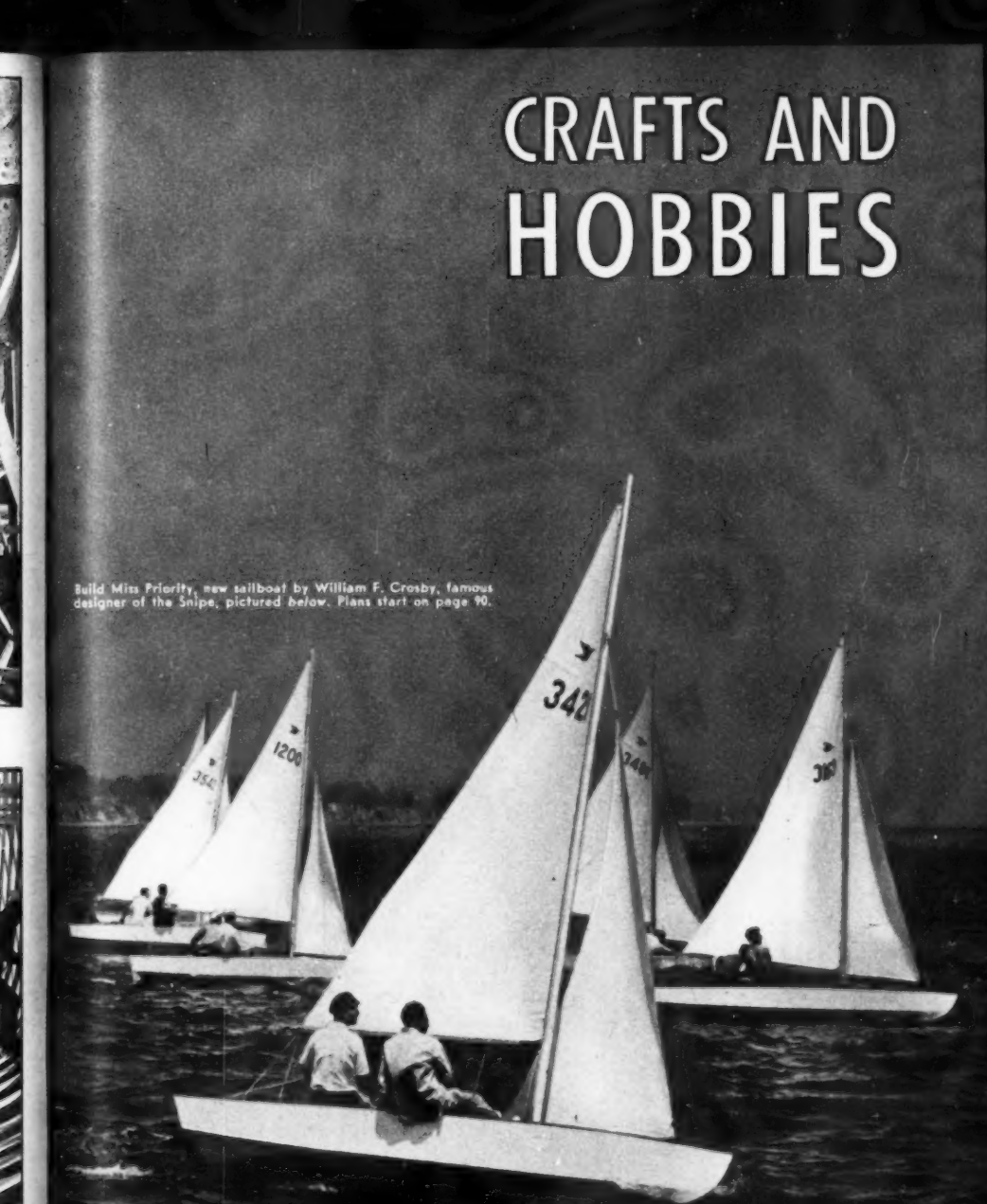
AS IN the days when Clipper ships ruled the world's seas, New England workmen are turning out U. S. fighting ships of wood. Subchasers, small coastal transports and scout vessels are among those that take shape in the Massachusetts yards of W. A. Robinson, Inc., where 500 skilled shipwrights, many of them descendants of the men who built the old Clippers, fight the battle of ships with old-style steam-chests, rib-benders and adzes, with the same methods as their grandfathers used.



Ribs in place, *above*, are prepared with adze and auger for planking.

Scouting vessel, *left*, gets last touching up before being launched.

# CRAFTS AND HOBBIES




Build Miss Priority, new sailboat by William F. Crosby, famous designer of the Snipe, pictured *below*. Plans start on page 90.

PHOTOGRAPHY • MODELS • RADIO
THE HOME WORKSHOP • FURNITURE
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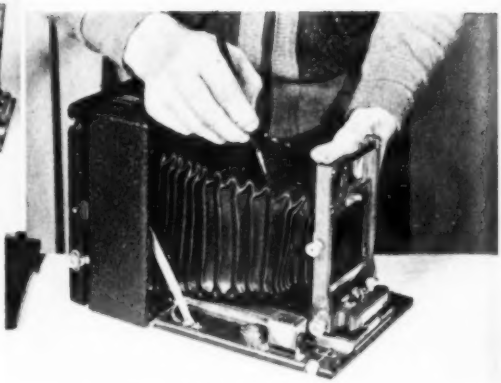
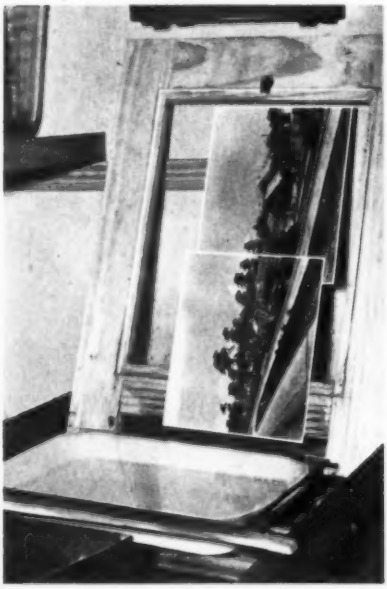
WOOD AND METAL WORKING • TOYS

*Photo From Rudder*

# PHOTO KINKS

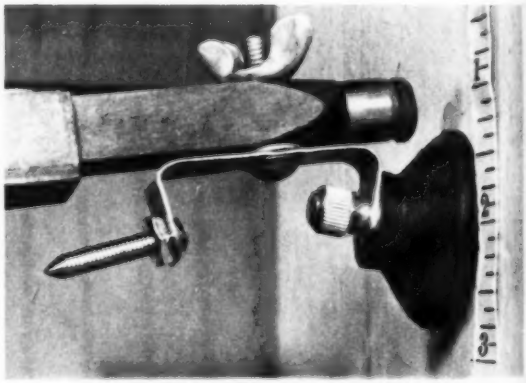


REFURBISH WITH SHOE DYE. Black liquid shoe dye can be used for spotting up worn spots on the inside and outside of the camera. Apply as many coats as necessary with a small camel hair brush. It dries quickly, in a smooth dead-black finish. You can use it to repaint the red bellows of an old camera also. *Harold P. Strand.*



*Above:* When retouching medium is not at hand, you can apply a small quantity of fine automobile valve-grinding compound to the back of the negative to be retouched, for the purpose. Apply a small quantity of the compound with a clean cloth and rub it into the negative with a light circular motion. Finally, wipe off any excess with clean cloth and retouch on dry, fine matte surface which remains. *Louis Hochman.*

*Above:* When it is necessary to match prints for a show-series or in the preparation of a montage, the task can be simplified by placing the print whose tone is to be matched behind a sheet of glass upon which the print being prepared is laid. The first print should have been fixed and washed briefly before being placed behind the glass. *R. A. Reilly.*

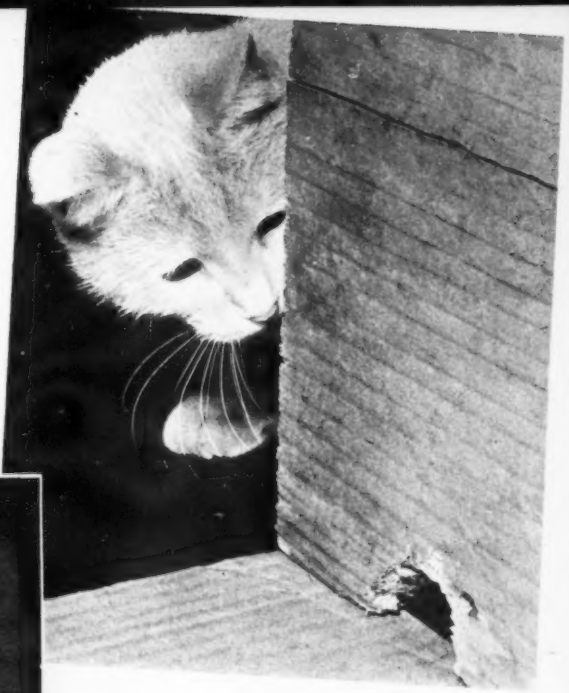


*Right:* Tripod leg tips may be adopted for use on any type of floor surface by attaching reversible suction and point tips mounted on a strip of thin brass, as shown. (Be sure that the brass strip is not too springy or it will vibrate.) When the original leg tip makes the best friction contact with the floor surface at hand, the brass strip is rotated on its screw to a horizontal position. *Donald Sternbergh.*

# PHOTO CONTEST

FIRST PRIZE (10.00) "On Guard" by LaVern Frost, Crystal, Michigan. Taken with Speed Graphic, on Super XX film, 1/200 second at f/16, No. 21 flash bulb. Developed in Pyro. SECOND PRIZE ($5.00) "The Struggling Strummer" by Harvey Colpe, 402 E. Custis Ave., Alexandria, Virginia. Taken with 9x12 Zeca, Dopple-Eurynar lens, 1/10 second at f/5.6 on Panatomic-X, two No. 2 flood lights, developed in DK-20. THIRD PRIZE $4.00) "On The Upgrade" by W. R. Wilson, 26 Albinson St., Sudbury, Ont., Canada. Taken on Super XX, 1/100 second at f/16 in bright sun. Developed in D-76. FOURTH PRIZE ($3.00) "'Lo Pal" by Irene Heffner, 327 Washington Ave., Albany, N. Y. Taken with Rolleicord II on Pantomic-X, 1/50 second at f/8 in bright sunlight. Developed in D-72.

1st PRIZE



3rd PRIZE

Submit prints for this month's contest unmounted—no larger than 8x10 inches. With each print list your camera, film, lens, opening and shutter speed, illumination, and developer. Write your full **NAME** and **ADDRESS** on the back of each print, and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published Prints cannot be returned.) Address: Photography Editor **MECHANIX ILLUSTRATED**, 1501 Broadway, New York, N. Y.

2nd PRIZE

4th PRIZE

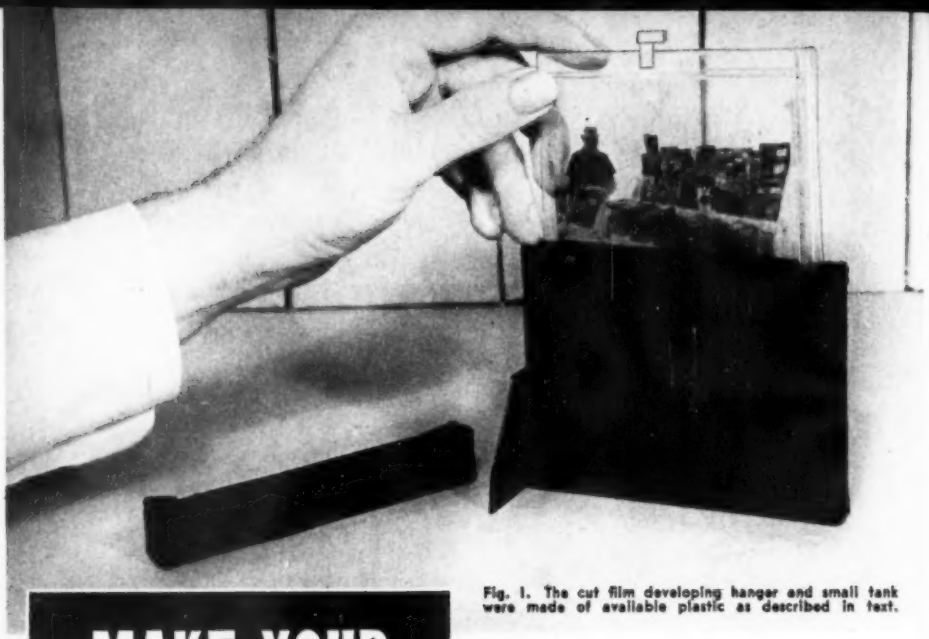


Fig. 1. The cut film developing hanger and small tank were made of available plastic as described in text.

# MAKE YOUR OWN PLASTIC PHOTO-GADGETS

by A. J. Lockrey*

NOW that metal and heavy plastic shortages have seeped through the entire production set-up right down to the retailer and ultimate consumer, most amateur photographers and "non-essential" professionals have come to the point where they will either have to do with accessories on hand for the "duration" or else . . .

Of course, heavier photographic accessories such as tripods, light booms, and such can be rigged up at home of wood. But what about strong, light-weight, chemical-proof materials for extra developing tanks, hangers, etc.? Some developing equipment can be made of special paints applied to waterproofed wood, or of slate materials and the like. Lighter and more rigid parts require something stronger, however—scrap plastics such as one might find in the ordinary household salvage collection.

The average "experimental mechanic" is apt to think that the problem of working plastics is beyond him; that it requires tremendous molding-presses and other heavy equipment and special tools. However, my experience in this field has taught me that practically every process in plastics, with the possible exception of injection molding and extrusion, can be duplicated in a small way by the average home workshop fan and that

Fig. 2. First step in fashioning sheet acetate to make the developing hanger—passing bent sheeting (bent over piece of wood) over the mildly warmed, paraffined electric iron.

*Author of Plastics in the School and Home Workshop—D. Van Nostrand Co.

the results, with a little practice, are satisfactory.

The most practical plastics for our purposes are grouped together under the general heading of "thermo-plastics"—i. e., plastics which can be bent or molded every time heat is applied to them. This would include cellulose nitrate ("celluloid"), cellulose acetate (film base) and the various vinyls and styrenes which have, in general, the same physical characteristics. The acrylic resins (Lucite, Plexiglass, etc.) are an exception, as they work more like the cast phenolics, which are described below.

All you have to do to work the thermo-plastics is to put them in hot water around 160-170° for a minute or two, bend them to the desired shape, and cool them in that shape. Heat in any other form may also be used, provided it is not too hot. Only nitrate is dangerous with dry heat, and you are not likely to encounter much of that. The test to show whether a material is the dangerous nitrate or the slow-burning acetate is to apply a match to a small bit of it. If it flashes, it is nitrate; if it burns slowly but determinedly, it is acetate (or "safety film").

Scissors, knives or practically any other type of tool may be used on thermo-plastics, and the material will break clean and true even after a knife-scoring. If power tools are used, however, the pressure must be very light, or else it will gum up the saw blade, drill bit, or carving tool, heat up, enlarge the hole, and damage the work. Acetate may be polished by dipping in acetone followed by drying. The other thermo-plastics require fine sanding (No. 7-0 paper), application of buffing compound, and finally polishing on a power-driven cotton buff. The brilliant finish you get is worth the trouble. Acetate and nitrate are the only materials of the group that can be successfully cemented by the average person with easily-obtained materials. Either regular film cement or acetone may be used for the purpose.

The most plentiful source of thinner sheet material is cut-film base. Roll-film stock is pretty thin, and therefore only good for rolled shapes such as small funnels, but the base used for cut-film is about .005-inch thick, which is fairly rigid, especially when it is formed in "L" and "U" shapes or otherwise self-strengthened. In some cases cut-film base can be laminated to make thicker sections—by dipping two or more sheets in acetone and drying the sandwich under a press between ferrotype plates. In making fairly complicated shapes, it is best to shape

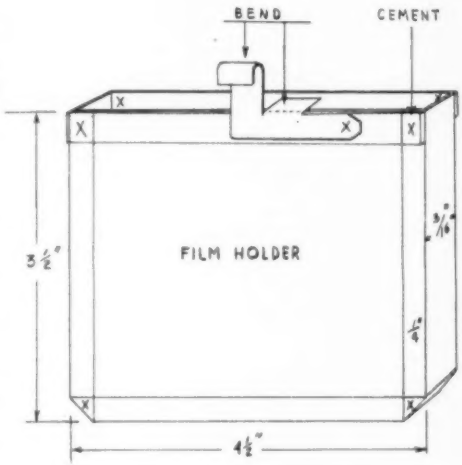



Fig. 3. Second bend is made by placing a second wood strip over first bent surface, to avoid buckling, then rolling the assembly on second bent corner for "polishing" against iron.

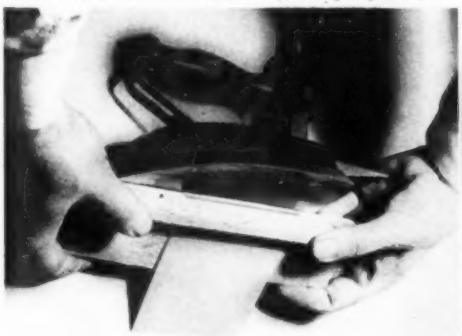
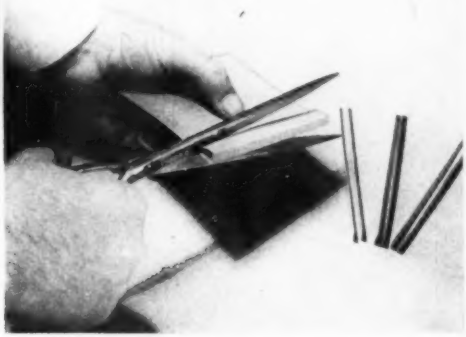


Fig. 4 (*below*): Cutting the resulting "U" channel from the acetate film sheet before repeating the two preceding operations; the "U" channel is the basic structural unit.



Cutting a rabbet on a lens board made from cast phenolic type of plastic. The cutting tool is held steady and the material pushed across the board, guided by a wooden strip clamped to the extreme left-hand edge of the work board.

them over a wooden form, although with a little experience fairly intricate free-hand work can be done.

As an example of what can be done with this thin film-base and the simplest technique, examine the developing hanger shown in Figure 1. This hanger is made from a single piece of 5 x 7 cut-film, fashioned into "U"-shaped channels, cemented together.

First, clean the emulsion from the sheet of cut film—soaking the latter in hot water to which an ounce or two of sodium carbonate (or any other alkali) has been added; then scrubbing the emulsion surface with a nail brush. Wrap the film around a strip of wood or metal the thickness of the desired inside dimension of the "U"—positioning the acetate material so that the desired bend comes over the corner of the wood. Place the short end against a mildly-warm, paraffined electric iron (Figure 2); then slowly roll the corner over, holding it against the iron. Slide the material back and forth in contact with the iron to smooth out the buckles; then quickly place the acetate material (still in position on the wooden form) against any cold surface to chill it suddenly. (Be sure that the electric iron is not too cool, or the acetate will not crease; if too warm, the material will buckle or melt.)

To make the second bend, place a second strip of wood over the first bent surface (to keep it from buckling) and roll the assembly over the second corner of the "U" channel (Figure 3) using the heated iron to form the crease, and chilling, as before, to "fix" the crease.

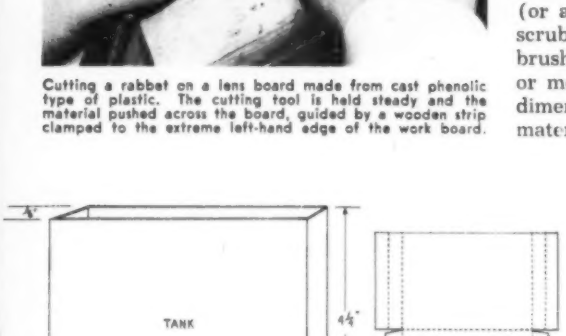



Fig. 5. Channels forming the developing hanger are assembled on a wood block cut to the exact inside dimensions desired—secured by Scotch tape while corners are cemented.

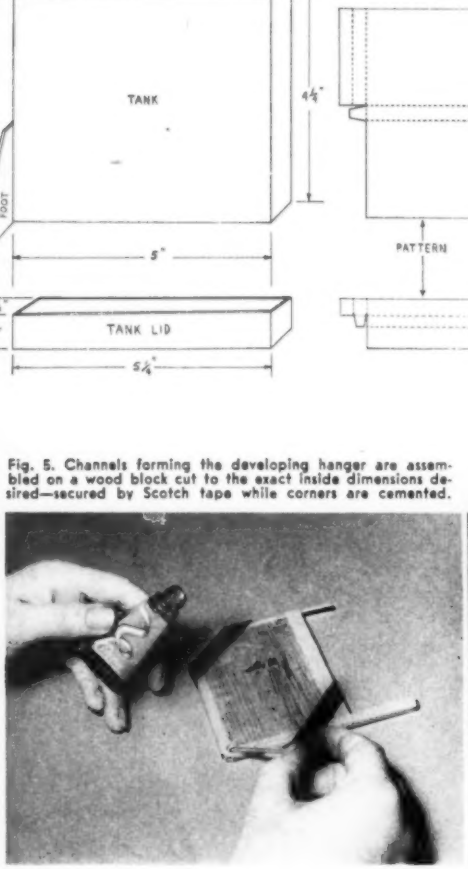
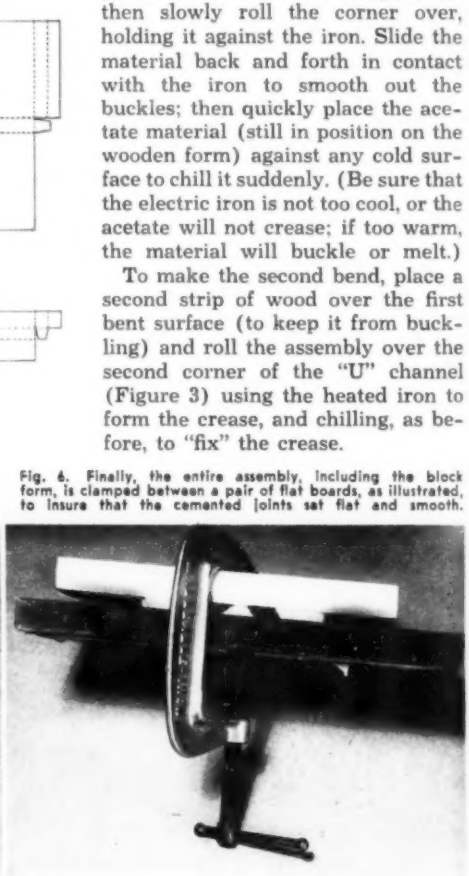


Fig. 6. Finally, the entire assembly, including the block form, is clamped between a pair of flat boards, as illustrated, to insure that the cemented joints set flat and smooth.



Now that the "U" channel has been formed, cut it off the end of the acetate film sheet (Figure 4) and repeat the operation to form as many channels as are required. (About six can be made from a single sheet of 5 x 7-inch film).

The hanger illustrated was designed to accommodate 3¼ x 4¼-inch film, and the drawing (page 87) is scaled to those dimensions. Cut a block of wood to the exact inside dimensions of the film holder and assemble the "U" channels around it, holding the latter in place temporarily with Scotch tape (Figure 5). Cement the corners of the three "U" channels (at the two sides and the bottom) to each other with film cement or acetone. Two heavier flat strips are cemented across the top between the two side pieces. The two bottom corners are cut off to provide for drainage while the projecting ends of the side pieces may either be cut off or bent to serve as supports. A clip hook is finally cemented to one of the two top strips to hold the film down and to clip the holder to the side of the tank in which it is used.

Before the unit can be used, the entire assembly—block form, and cemented strips—must be clamped for a few hours between flat boards (Figure 6) to insure flat, smooth setting of the joints.

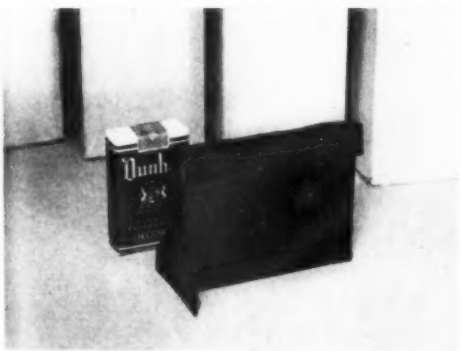
Make the developing tank (Drawing—page 88) of a thicker material (.020 to .030 inch thick) or, several thicknesses of thinner material laminated with acetone—dried under pressure between two chrome ferrotype tins. If you haven't opaque acetate, use clear material dipped in any black lacquer like Duco, Kodacote, or Willo-Black. The tank may either be bent to shape from a pattern or assembled from several properly-shaped pieces. Folds are made with a wooden block and an electric iron, as before, and joints are made with film cement. Leaks at corners may be sealed either with dissolved film base or lacquer.

Among other thermo-plastic photo-gadgets that can be made at home are dodging tools, print tongs, enlarger filter holders, stirring rods, measuring dishes and the like.

*Above:* Heavier plastic materials can be worked with electric hand tools; this shows turning without a lathe—by gluing or screwing the block of plastic to a pivoted wooden block and then turning the latter by hand against the cutter.

*Below:* The heavier type of plastic material is rabbeted by bending both the tool and work against a guide. Both of these photographs are from the author's textbook "Plastics in the School and Home Workshop"—D. Van Nostrand Co.

A finished 2-ounce developing tank made with black opaque plastic from the detail drawing on the facing page and fashioned by the system outlined in the preceding illustrations.



Other types of plastics, apart from thermo-plastics include thermo-setting molded plastics with mineral filler and cast phenolics.

The former is the lowest grade of plastic and the most difficult to work. It includes bakelite (and other brand-name) panels and knobs which break with a ragged, lustreless fracture surface. The cut surface can never be polished; the material can be shaped only by sawing, filing, drilling, etc. You can saw knobs, handles, and little brackets from any scrap of this type of material you may have on hand.

Cast phenolics, which bear such trade names as Catalin, Bakelite Cast Resinoids, Opalon, Marblette, etc., are mid-way down the scale of hard- [*Continued on page* 136]

# Miss Priority—

## by William F. Crosby

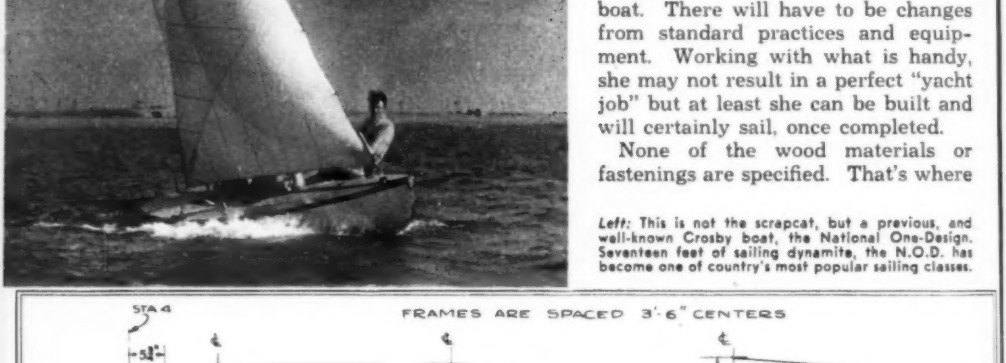
*Photos Courtesy Rudder Magazine*

THE purpose of designing this little sailing craft was primarily to present something in the way of a boat that may be built at the present time even in the face of all kinds of critical material shortages. There is nothing difficult about Miss Priority's construction and, when completed, she should at least form a sort of stop-gap for the duration. She should, in short, satisfy that urge to sail.

Builders will have to use plenty of ingenuity in order to complete this boat. There will have to be changes from standard practices and equipment. Working with what is handy, she may not result in a perfect "yacht job" but at least she can be built and will certainly sail, once completed.

None of the wood materials or fastenings are specified. That's where

*Left:* This is not the scrapcat, but a previous, and well-known Crosby boat, the National One-Design. Seventeen feet of sailing dynamite, the N.O.D. has become one of country's most popular sailing classes.



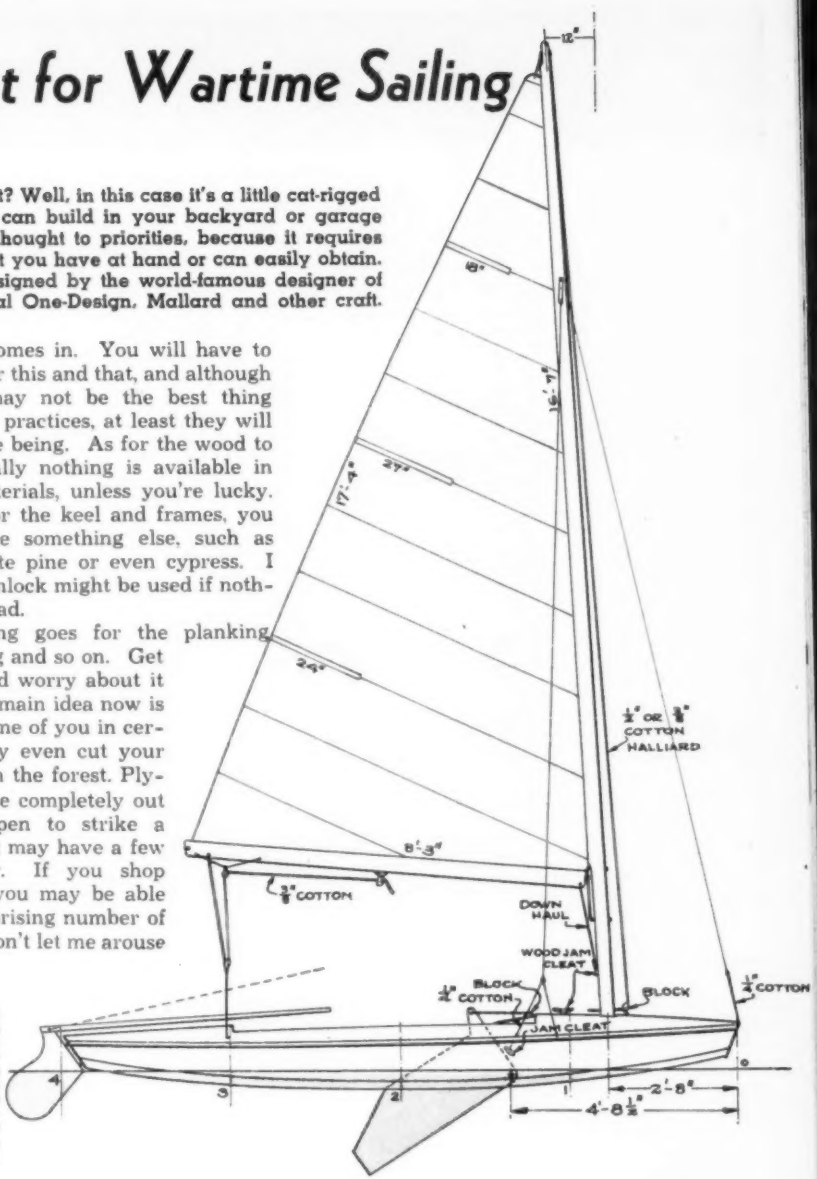

Dimensions of all frames and both transoms are given above. Use any obtainable wood for these parts, painting well before and after assembly.

# Scrapcat for Wartime Sailing

**What is a scrapcat? Well, in this case it's a little cat-rigged sailboat that you can build in your backyard or garage without giving a thought to priorities, because it requires only materials that you have at hand or can easily obtain. Best of all, it's designed by the world-famous designer of the Snipe, National One-Design, Mallard and other craft.**

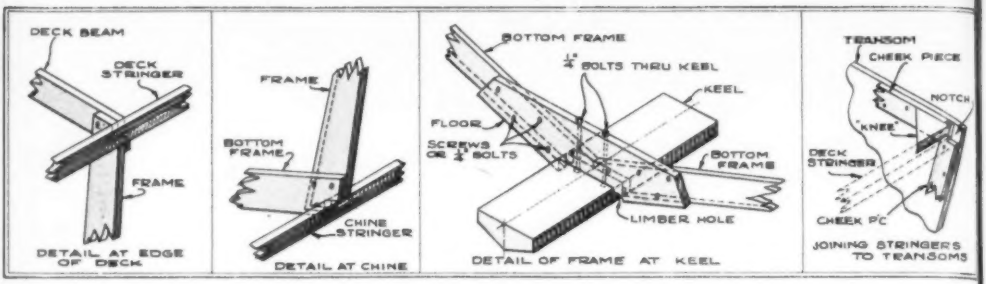
your ingenuity comes in. You will have to use substitutes for this and that, and although some of them may not be the best thing according to past practices, at least they will serve for the time being. As for the wood to be used, practically nothing is available in the standard materials, unless you're lucky. Instead of oak for the keel and frames, you may have to use something else, such as yellow pine, white pine or even cypress. I suppose even hemlock might be used if nothing else is to be had.

The same thing goes for the planking, stringers, decking and so on. Get what you can and worry about it afterwards. The main idea now is to get afloat. Some of you in certain districts may even cut your own lumber from the forest. Plywood, is of course completely out unless you happen to strike a lumber yard that may have a few pieces left over. If you shop around enough you may be able to pick up a surprising number of good parts, but don't let me arouse any false hopes.




*Right:* Sail plan and other details of Miss Priority. She uses a standard Snipe mainsail. Cost of building this boat should be very low due to the use of inexpensive and substitute materials, but she'll perform like a pre-war thoroughbred.

The sail for this boat is a standard Snipe sail—main only—and you should be able to buy one of these second-hand or even new from some of the sailmakers, as many of them made it a practice to keep Snipe sails "on the shelf" ready for immediate delivery. There may have been a Snipe fleet in your vicinity before the war came along and no doubt many of these former skippers are now in the service. Possibly, they might be willing to sell their sails. At any rate, if you do get a sail of this type, you want it made for use in a slotted mast with no sail slides. By using this type of sail, we eliminate the track entirely and actually get a better setting sail, as it hugs the mast closer and doesn't spill the wind between the luff of the sail and the mast itself. The ordinary sail, however, will not

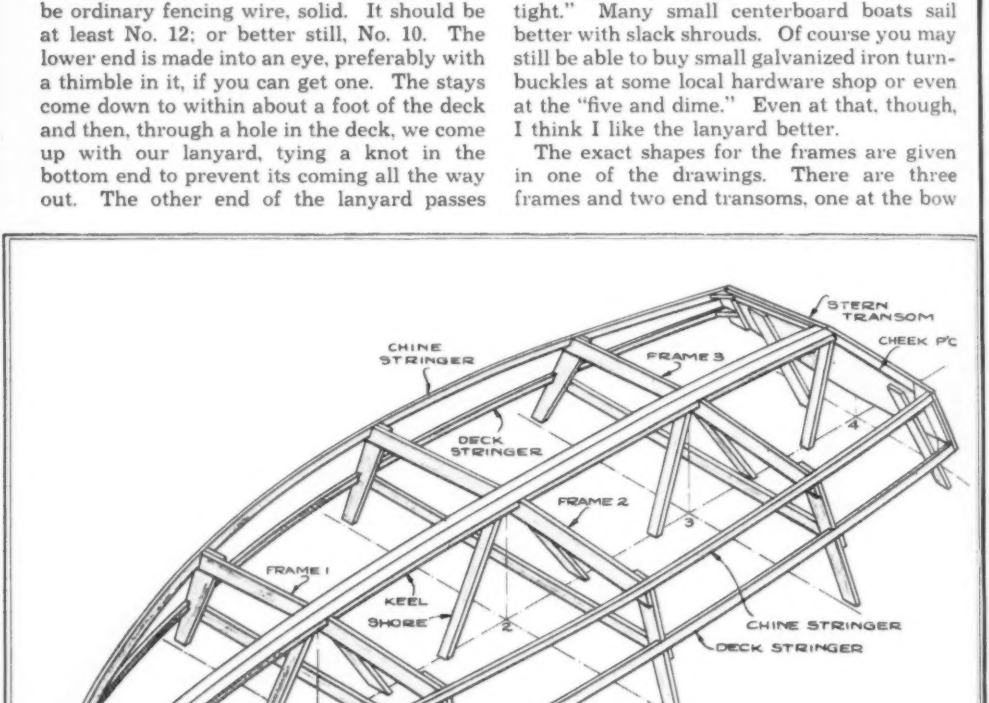



Here are details of frame joints. It's a good idea to fasten up these parts with wet paint on the adjoining surfaces, to offset chances of rot starting later on.

do because the luff rope is not suited for the slotted mast and all the strain is put on the cloth of the sail just below the headboard.

Turnbuckles have been eliminated in favor of simple lanyards. Your wire rigging may be ordinary fencing wire, solid. It should be at least No. 12; or better still, No. 10. The lower end is made into an eye, preferably with a thimble in it, if you can get one. The stays come down to within about a foot of the deck and then, through a hole in the deck, we come up with our lanyard, tying a knot in the bottom end to prevent its coming all the way out. The other end of the lanyard passes through the eye on the end of the stay and then passes down through another hole in the deck and aft to a wooden jam cleat, where you can regulate the tension. Generally speaking, the stays do not have to be "bar tight." Many small centerboard boats sail better with slack shrouds. Of course you may still be able to buy small galvanized iron turnbuckles at some local hardware shop or even at the "five and dime." Even at that, though, I think I like the lanyard better.

The exact shapes for the frames are given in one of the drawings. There are three frames and two end transoms, one at the bow




Framework is set up as above, on a flat floor or platform made for the purpose. Brace all frames strongly in position, as planking tends to pull them out of line. Be sure to check angles of transoms (ends) carefully.

and the other at the stern. The dimensions are all given from a base line which will later on become your erecting floor. The boat will be built upside down for ease of construction. The only place where you might go wrong is in the building of the transoms. You will note that each is set at a specified angle. On the other hand the actual dimensions for the outline of these transoms are given as if the transom were flat, that is on a vertical plane the same as the frames. The only thing you have to do is to make the transoms to the shape shown and then erect them at the exact angles as given. This is a most important point and is usually the place where amateur boat builders go wrong. The actual distance across the face of the transom is greater than the straight up and down distance, because of the angle at which it is set.

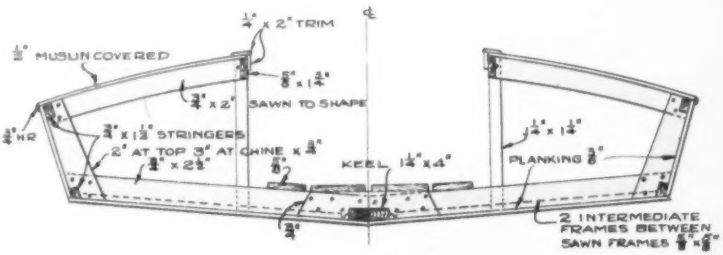
In setting up these transoms, it is advisable to make a jig or shores to hold it at the exact angle specified, then fasten the transom to this so that it cannot possibly move. When you start planking, it is obvious that there is a considerable strain on the entire frame work and as a result the whole frame must be shored strongly or it may jump up and cause trouble.

The frames are made long on purpose so that they will, when set up on a level floor, come to the proper heights for keel, chine and sheer or deck. The notches for these various stringers may be cut either before or after the frame is set up. Personally, I prefer to do this job later, as I can bend my stringer around and get the notches and bevels exactly right. The same goes for the keel.

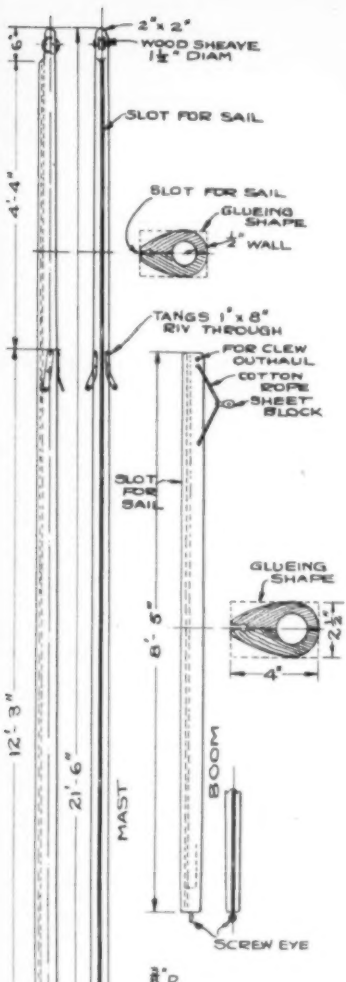
Of course, the stringer for the chine is set in so that the inner lower corner is the deepest point. Due to the angle, the other corner should stick out a little in the air. By planing fore and aft along this line parallel with the line of the bottom frames, you can bevel the entire surface of the chine so that the bottom planking will lie on smoothly. In the drawing each frame is composed of five pieces, two topside frames, two bottom frames and a "floor timber" across to join the keel ends of the bottom frames. Actually, there is so little vee in the bottom that you may be able to use one single piece all the way across the bottom, thus eliminating all the fastenings between floor timbers and the frames. This construction would be better and stronger.

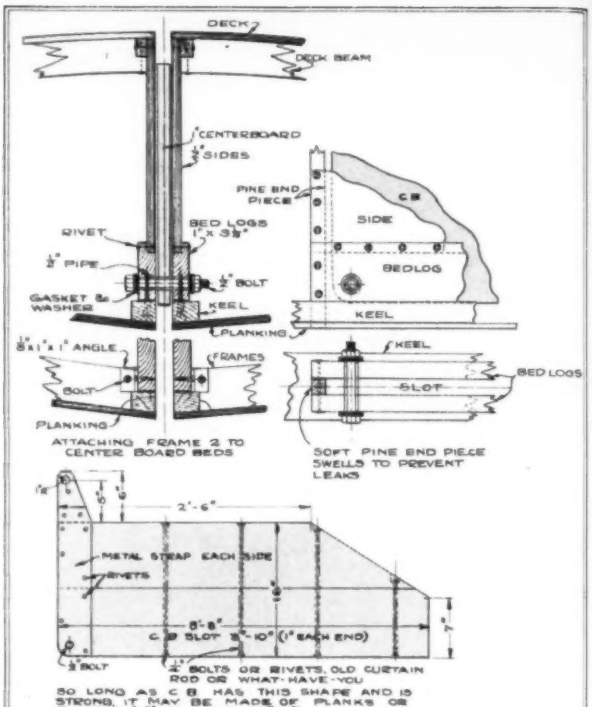
Another popular Crosby design—the Sea Gull. Many of these boats have been built, some without cabins as racers, others with cabins as cruising craft. Mr. Crosby is also an author and marine engineer; he has written several books for amateur boat builders, and is at present chief engineer of the Huckins Yacht Corp., builders of motor torpedo boats for the Navy.

The keel is set into notches in the frames so


¼" x 2" TRIM
½" MUSUN COVERED
⅝" x 1¼"
¾" x 2" SAWN TO SHAPE
¼" HR
¾" x 1½" STRINGERS
2" AT TOP 3" AT CHINE x ⅜"
¾" x 2½"
KEEL 1¼" x 4"
1¼" x 1¼"
PLANKING ⅜"
2 INTERMEDIATE FRAMES BETWEEN SAWN FRAMES ⅜" x ⅝"

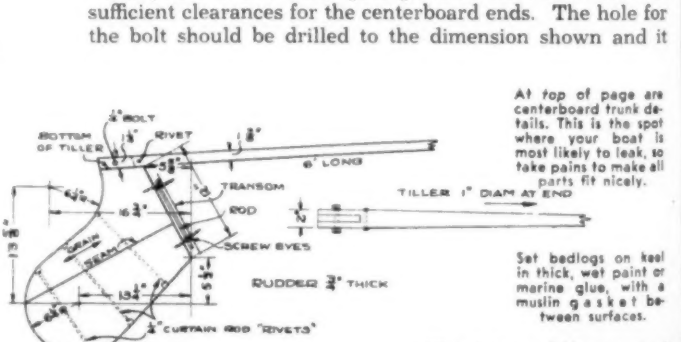
Cross section of the scrapcat's hull shows sturdy but simple construction. If you can get marine plywood for the planking, you're lucky, and by all means use it; otherwise cedar, pine or other solid wood cut in random widths will do nicely.




that the exposed surface of the keel comes even with the actual point of the frames. The keel is then planed down at the same bevel as the bottom frames so that, again, the planking will lie flush over it. In this boat no keel is exposed. The planking goes clean over it and forms a seam down the center line of the boat.

Either before or after the keel is planed to shape, the slot for the centerboard should be cut. It must be longer than the centerboard as well as wider. The soft wood end pieces will also make it longer. The forward end of this *slot* should come exactly 4′ 6″ from station O. The *slot* should be 4′ long and 1⅜″ wide. The length of the slot is sufficient to allow you a 1″x1⅜″ soft pine piece at each end and also sufficient clearances for the centerboard ends. The hole for the bolt should be drilled to the dimension shown and it

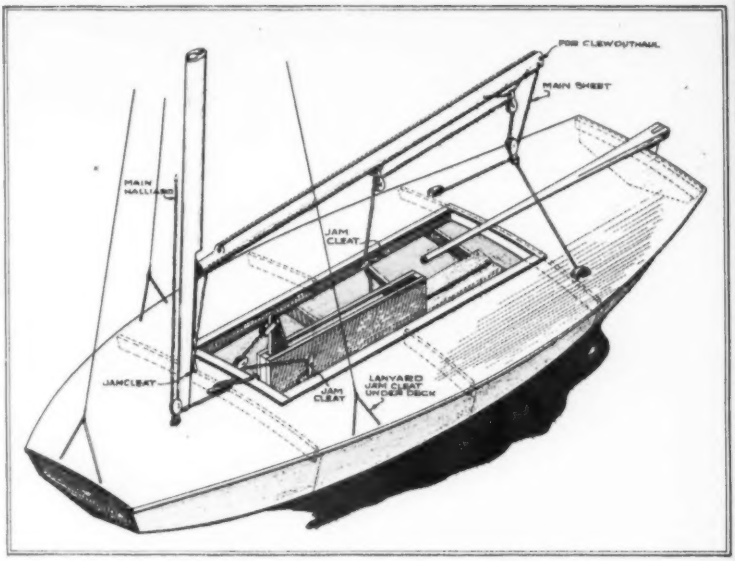



At *top* of page are centerboard trunk details. This is the spot where your boat is most likely to leak, so take pains to make all parts fit nicely.

Set bedlogs on keel in thick, wet paint or marine glue, with a muslin gasket between surfaces.

should be 1" above the inside of the keel.

The end pieces are the important thing. They go clear down from the very top of the centerboard trunk to the *outside* of the keel. They should be tight fits in the keel slot and should be dipped in wet paint just before you drive them through the slot. Be sure that they are up in the extreme ends of the slot (which must be cut square), or the boat will be sure to leak.



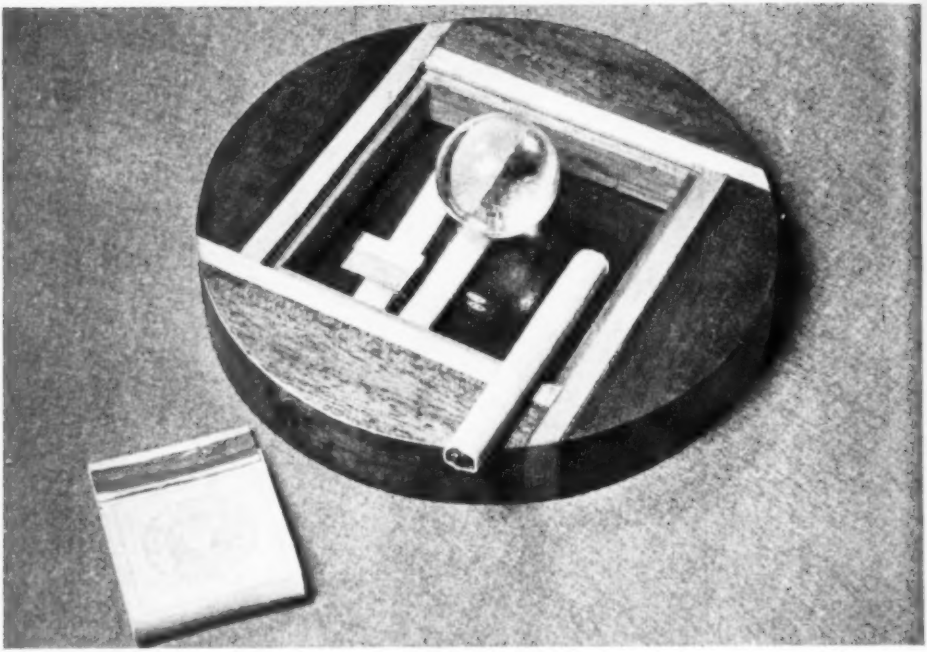

Deck arrangement, showing fittings and stays.

The centerboard bed logs may be cut to shape at this time, rabbeted to receive the sides and the sides screwed, riveted or nailed securely. Put some paint in this rabbet before you put in the sides. The bed logs should be clamped up under the keel, remember the boat is still keel up, and then screwed or fastened securely to the inner surface of the keel, again using wet, heavy paint between the keel and the surfaces of the bed logs. In fact a felt gasket, dipped in old paint or varnish is the best thing to avoid leaks.

With this job done, you may proceed with the planking. Start with the center planks over the keel and work out. You will find that if you bend one of these planks fore and aft with the acute bend in the center, the plank will protrude considerably beyond the centerline of the boat even though the ends come at the right spots. This is due to the bend and we will have to cut this plank to shape by clamping it securely in place and marking it carefully up underneath—then removing it and cutting to the shape. The other edge may be straight. Vee each seam slightly outward so that seam composition may be inserted before painting. It is not customary to caulk a small boat of this type but if you wish you can run in a few strands of cotton, doing so while the seam is wet with fresh paint. This makes it stick better.

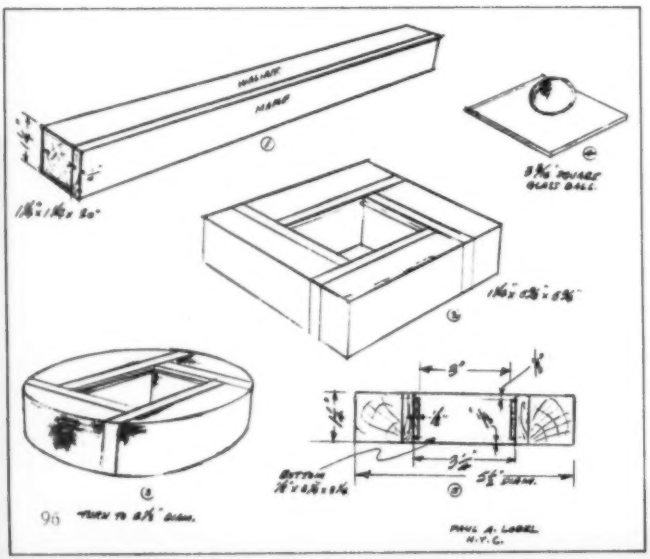
As your planking nears the chine you will find that it has to be planed off even with the latter. When this is done be sure to plane it at the same angle as the topside of the boat, otherwise you'll not have a good joint. The side planking will probably go on all in one piece. You clamp your material up alongside the frames [*Continued on page* 134]

You guess it. This is the *Tern*, a 27-foot Crosby-designed auxiliary cruising sloop. She's comfortable as well as beautiful.



# MODERN CIGARETTE

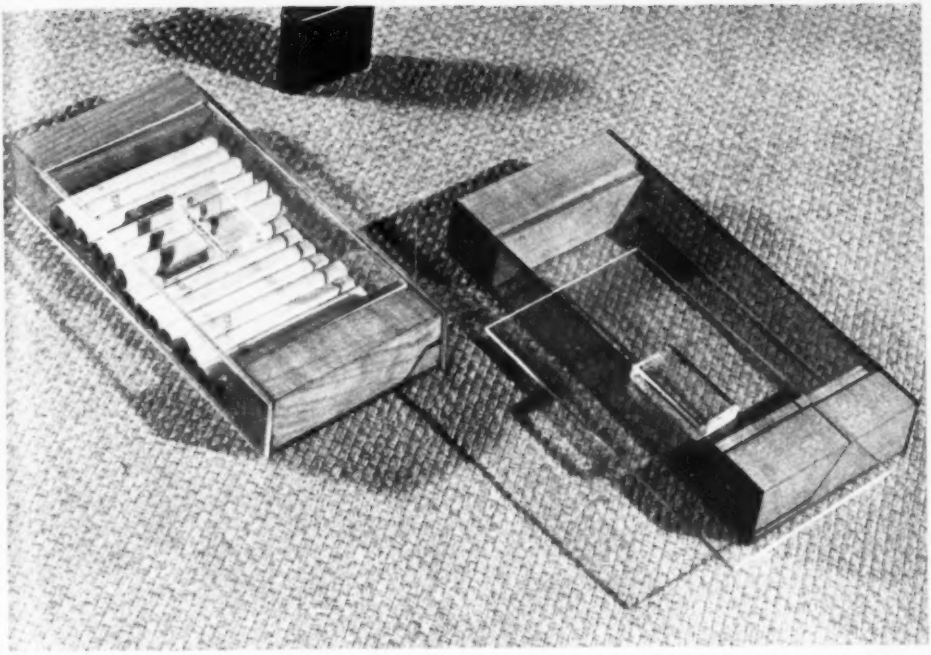
by Paul A. Lobel




THE utilization of salvage, a commendable virtue in ordinary times has now become a patriotic duty.

The cigarette boxes illustrated above were constructed from a broken window pane, a bit of plastic and some wood scrap destined for the fireplace.

**The rectangular box** consists of two glass sides (2), glass bottom (1), glass top (3), and two wooden end pieces (4). Cut glass to the dimensions shown in the accompanying sketch. (For information on glass cutting



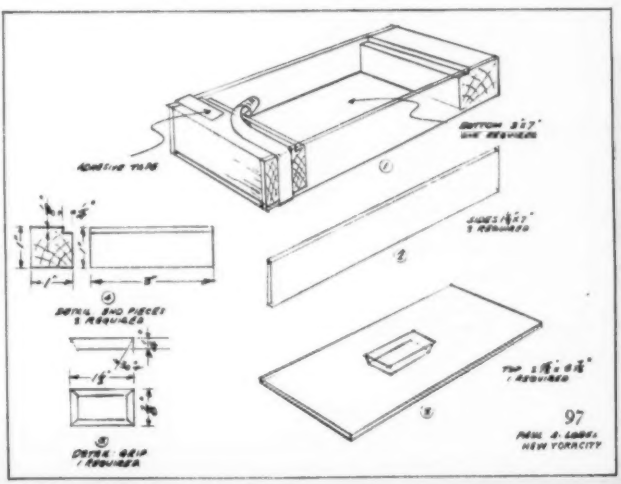
# BOXES

**Two beautiful and interesting designs for the home craftsman by a well-known industrial designer and artist.**

consult the article in MECHANIX ILLUSTRATED, February, 1943, page 112.) Have your local glazier seam all the edges of the glass (this removes the sharp edges) or you can do this yourself with a file dipped in turpentine.

Cut two pieces of wood for the ends (walnut was used in the box illustrated), making sure that they are square and true. Sandpaper and rub down with oil and pumice. If you prefer a professional elegance, finish with three successive coats of spar varnish, rubbing the first two coats down with fine sandpaper and the last with rottenstone dipped in linseed oil. Wax and polish with a felt rag. Allow at least twenty-four hours for thorough drying between each coat of varnish.

The box is now ready for assembly. Set up the two sides flush with the wooden end pieces and overlapping the bottom, as shown. Cement bottom and sides to end blocks with a transparent cement, bind with adhesive [*Continued on page* 140]



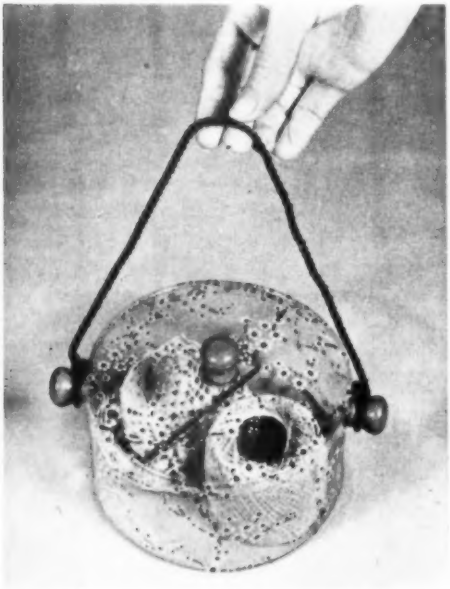
# HOME AIDS

## Wrench Used As Yardstick Holder

IF NO one is handy to help adjust the length of a dress, place the end of the yardstick in the tightened jaws of a wrench. Both hands will be free to make necessary adjustments.

## Small Laundry Paddle

YOU can lift small articles like napkins and handkerchiefs from the laundry tub or basin with an inexpensive paddle made by fitting a square of inner tubing into the split end of a length of dowel stick, as shown.

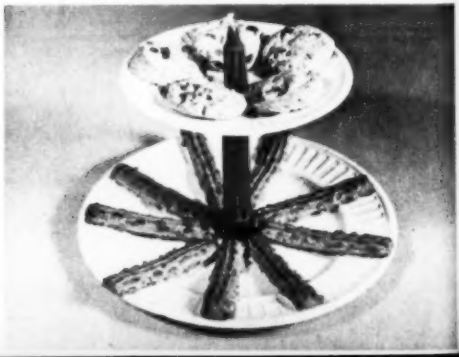


## Transparent "Work" Box

ATTRACTIVE powder puff containers may be easily converted into convenient work boxes holding crocheting and small knitting materials. Attach three pot-lid knobs as shown and add a length of bright-colored dime-store cord.

## Double-Tier Snack Tray

TWO paper plates and a wax candle may be arranged to make an attractive snack tray—in any color scheme. Cut candle about $1\frac{1}{2}$ in. from its tip, and press on plates.



## Fork Protects Garment Material

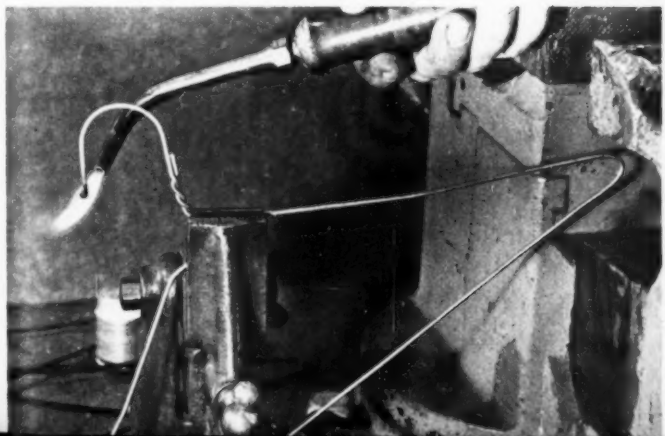
WHEN removing a button from an article of clothing, the simple device illustrated at the right will prevent damaging of the material. Just slip the fork under the button before beginning to cut the thread with the scissors.

## Loosen Tight Jar Caps

STUBBORN jar caps may be removed very easily by placing the jar between the kitchen door and door jamb, then closing the door until the cap is squeezed. Twist jar and cap will come off easily.

## Ice Cube Moistens Envelope Flaps

WHEN it is necessary to seal a large number of envelopes at one time, an ice cube can be used to avoid the need for using the tongue or a messy sponge. Place ice cube in saucer and run envelope flaps over it.

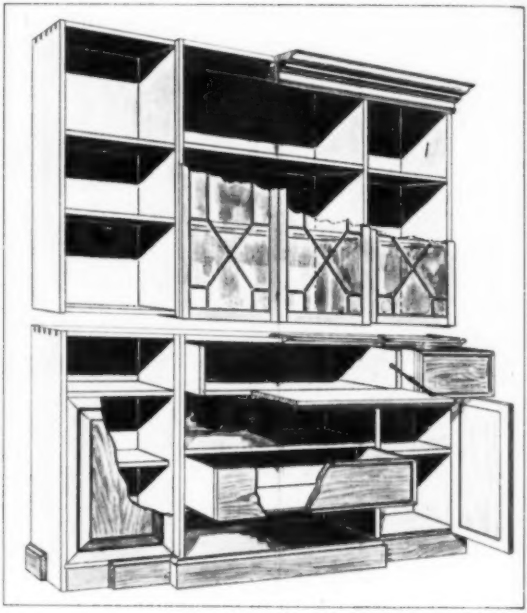


## Treating Scratchy Clothes Hangers

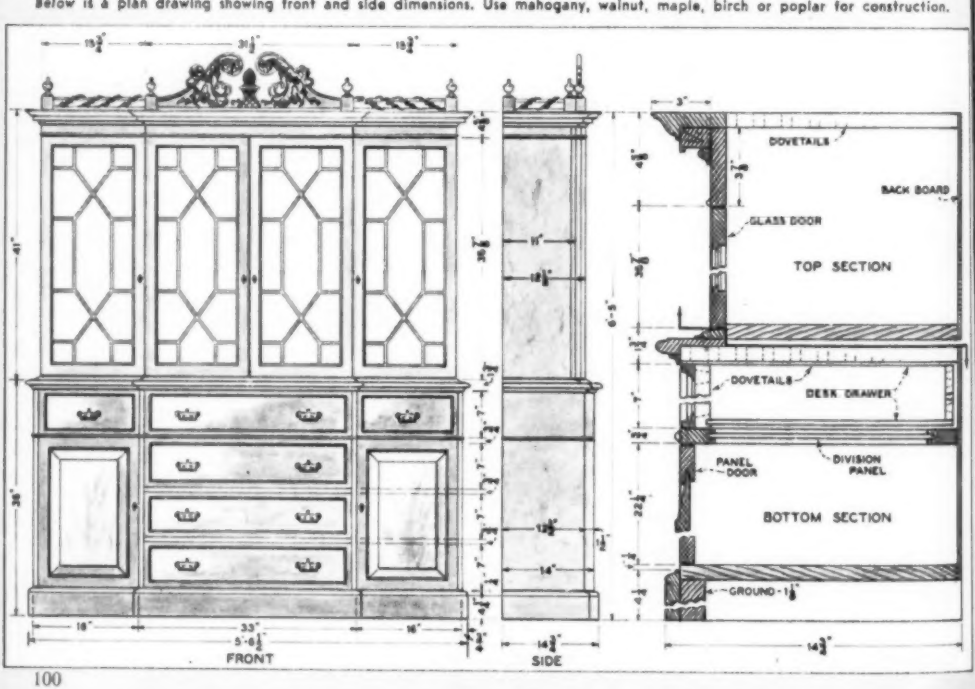
THE rough end of a clothes hanger can be smoothed out, either by forming a bead of solder or brass at its end with a torch, or, if sufficient heat is available, by melting the wire until a bead forms at the end. After cooling, apply a coat of lacquer or enamel.

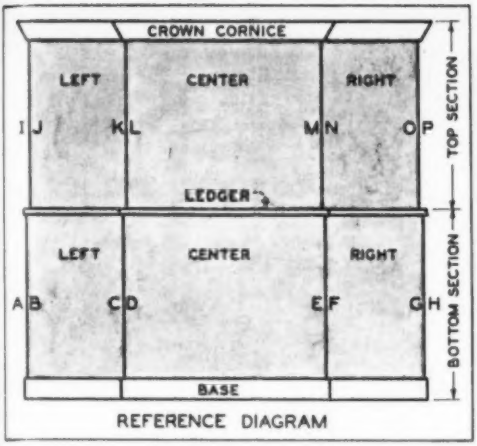
# EIGHTEENTH CENTURY BREAKFRONT

This piece of furniture is not only attractive but extremely useful. Top and bottom sections are not attached. The bottom section should be made first.



*Below* is a plan drawing showing front and side dimensions. Use mahogany, walnut, maple, birch or poplar for construction.





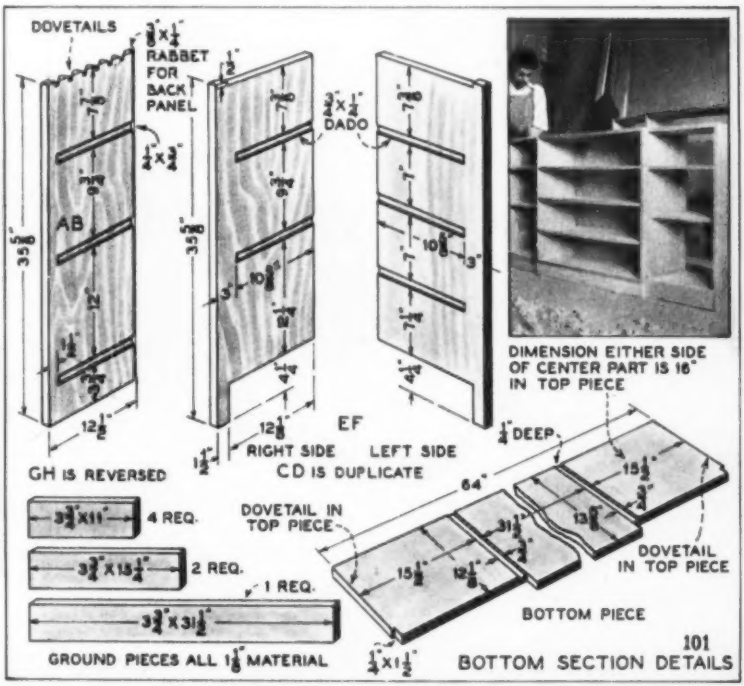
REFERENCE DIAGRAM

At *left* is the reference diagram for locating sides and ends in the detail drawings. At *right* is photo of completed breakfront with open desk.

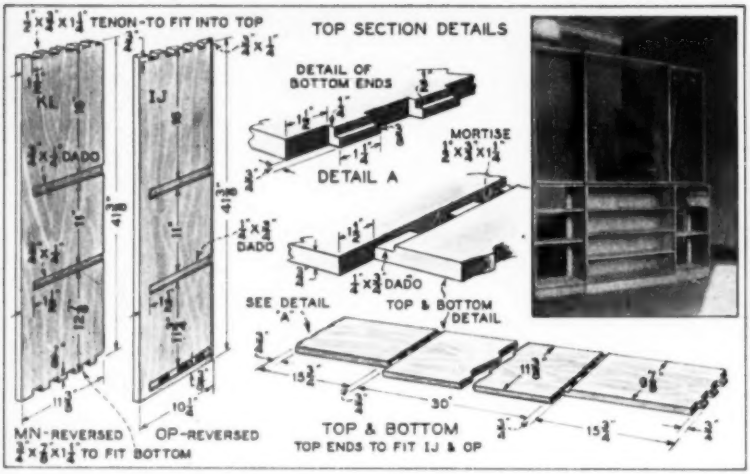
ONE of the major problems confronting the interior decorator of our twentieth century is the selection of furniture which will be appropriate for the limited living space of our dwellings. For the small and compact apartment he must choose pieces which will be attractive, in proportion to the size of the rooms, and at the same time be useful for many purposes. It is for this reason, perhaps, that the breakfront has achieved widespread popularity as a living-room piece. It is a unit ideally suited to apartments limited in dimension and makes the living-room at once a reception room, a library, a music room and a study.

In addition to serving a practical purpose, the breakfront, like a baby grand piano or a fireplace, offers admirable possibilities to the

At *right* is a detail drawing of bottom section, showing ends, bottom, top and ground. Top is 65" long. Compare with the diagram *above*.



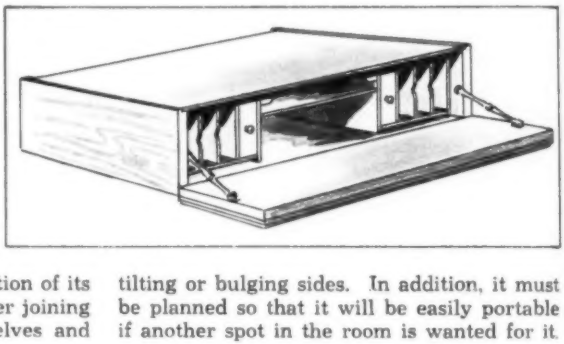
BOTTOM SECTION DETAILS



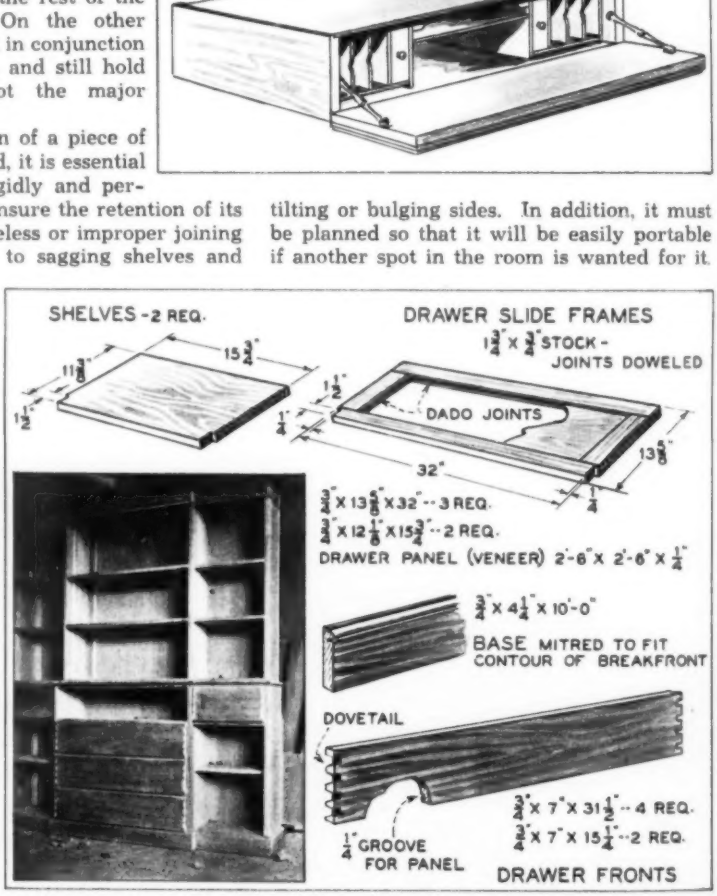



At *left* is detail of top section. Compare with reference diagram on previous page. *Below:* Sketch of writing compartment. Design will vary to fit individual needs.

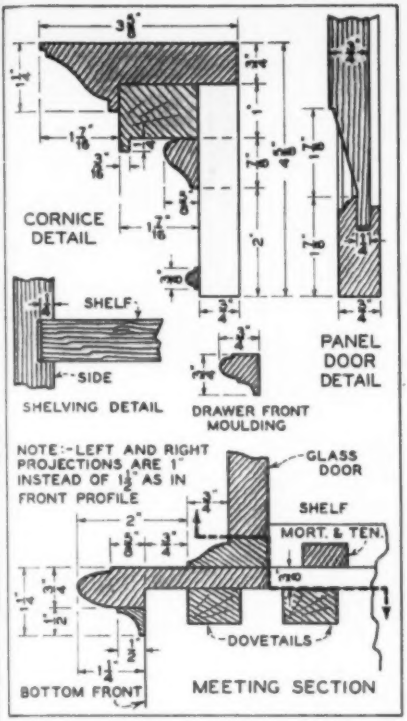
decorator for its placement in a center-of-interest spot, around which can be built the rest of the room's furniture. On the other hand, it may be used in conjunction with a larger piece, and still hold the ground, if not the major interest.

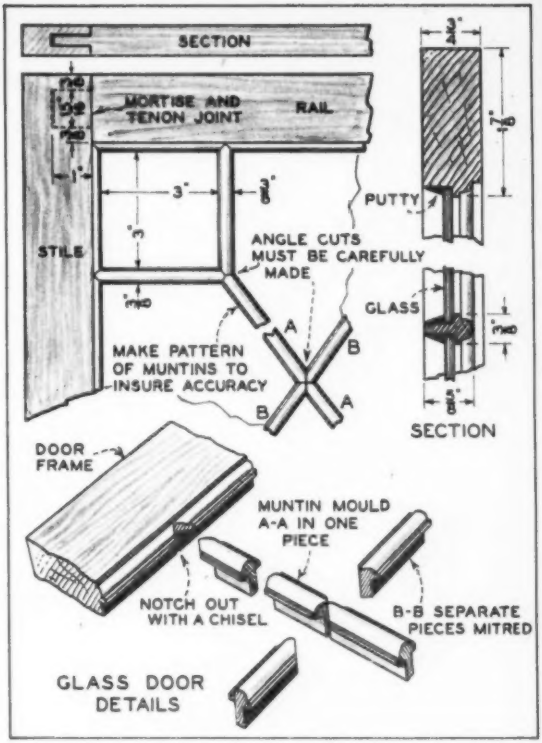


In the construction of a piece of furniture of this kind, it is essential that all parts be rigidly and permanently joined to insure the retention of its original shape. Careless or improper joining of parts leads only to sagging shelves and tilting or bulging sides. In addition, it must be planned so that it will be easily portable if another spot in the room is wanted for it.


SHELVES - 2 REQ.
DRAWER SLIDE FRAMES
1¾" X ¾" STOCK - JOINTS DOWELED
DADO JOINTS
32"
¾" X 13⅜" X 32" -- 3 REQ.
¾" X 12⅛" X 15¾" -- 2 REQ.
DRAWER PANEL (VENEER) 2'-6" X 2'-6" X ¼"
¾" X 4½" X 10'-0"
BASE MITRED TO FIT CONTOUR OF BREAKFRONT
DOVETAIL
¼" GROOVE FOR PANEL
¾" X 7" X 31½" -- 4 REQ.
¾" X 7" X 15¼" -- 2 REQ.
DRAWER FRONTS

Side shelf is shown at *right*. Other shelves are similar. Smaller slide frames are used for the side drawers. See parts list in text.




*Above:* Details of cornice, panel door, shelving, molding and meeting section. *Right:* Drawing of door detail.

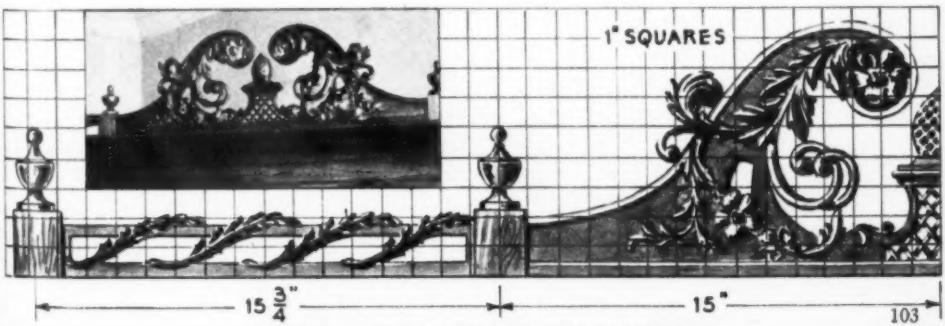
Constructing it in sections, then, facilitates the handling and subsequent placement.

In the design of the eighteenth century breakfront, the minute details of cornice profiles and projections, as well as the general mass proportions of the piece as a whole, should be carefully studied and followed as closely as possible when all moldings and members are to be cut by hand.

If the making of moldings is impossible or impractical for the craftsman or amateur, stock moldings that closely correspond in appearance and measurements to the ones given should be used. Extreme care must be taken in the latter step if the individual is interested in maintaining faithfulness to design.

Finally, the pediment and parapet crowning the breakfront are optional. Their inclusion on the piece depends on the ability of the worker to do a good carving job.

Since most hard woods are sold in random lengths and widths it is impossible to prescribe any specific sizes that should be bought. However, in studying the sketches and details of the [*Continued on page* 138]




DETAIL OF CARVED ORNAMENT

# BACKYARD RANGER COURSE

**This simple and inexpensive obstacle course will do much to train young Americans in modern Commando tactics, and it'll build sound muscles and healthy bodies, too!**

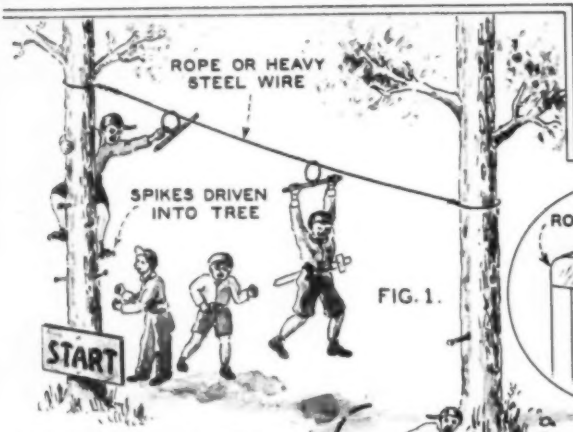
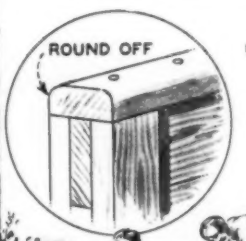



FIG. 1.




USE RANDOM BOARDS WITH A 2"X4" TOP RAIL NAILED SECURELY

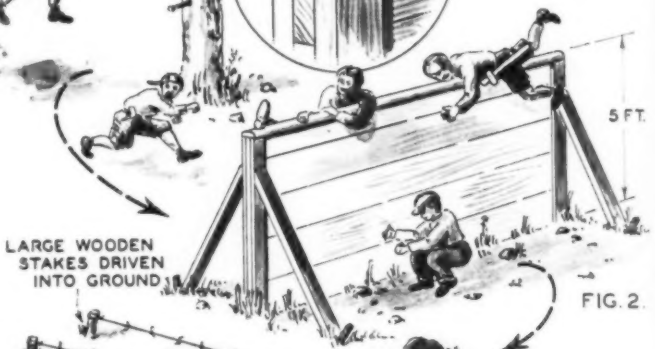



FIG. 2.

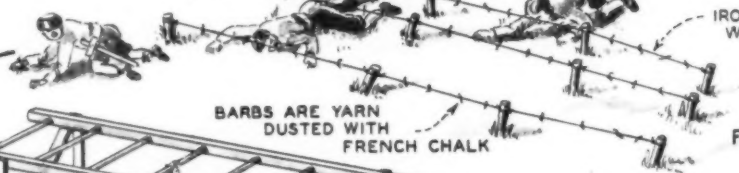



FIG. 3.

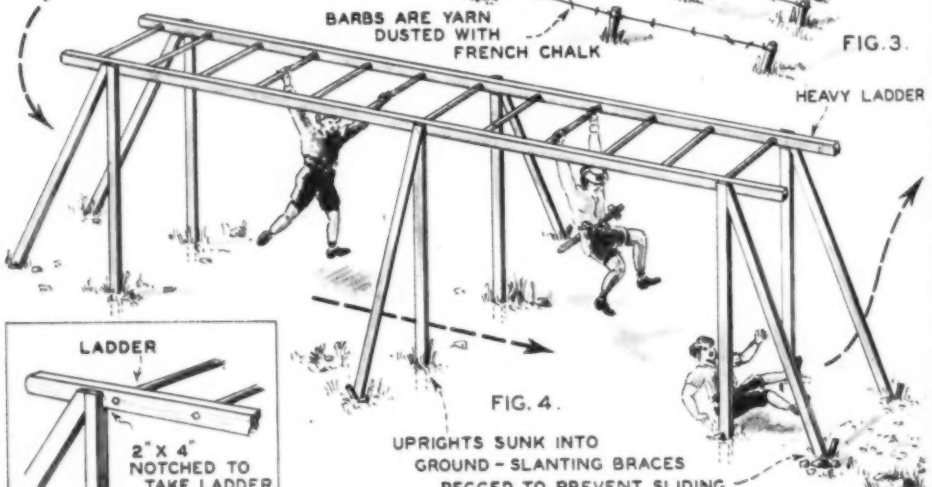
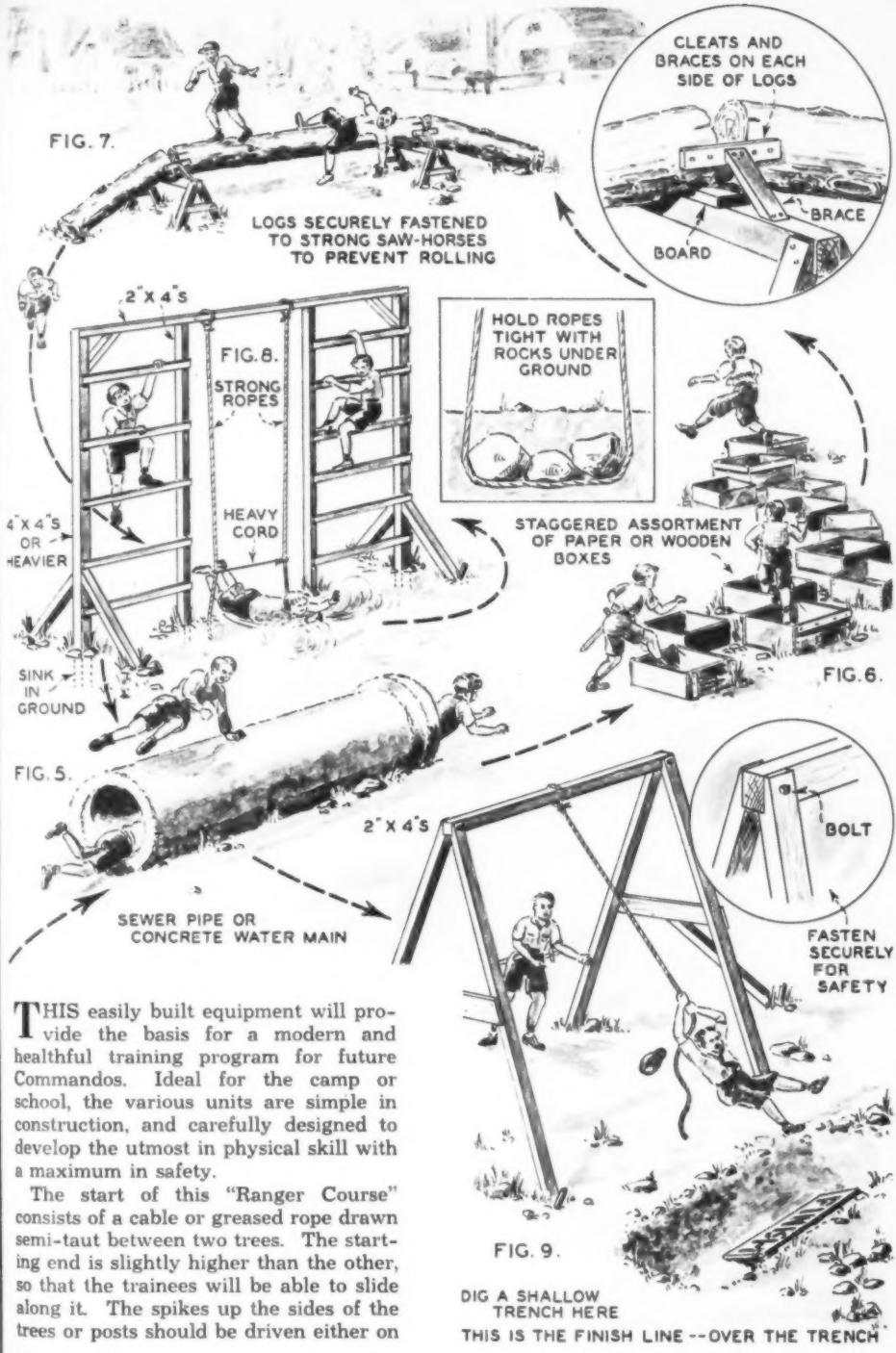






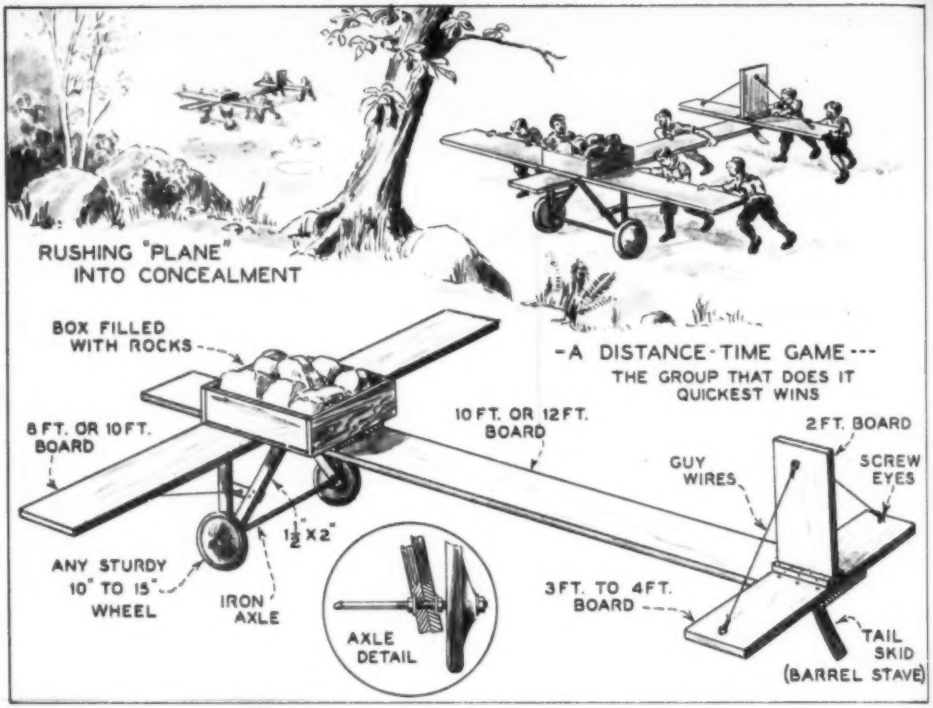
FIG. 4.

UPRIGHTS SUNK INTO GROUND – SLANTING BRACES PEGGED TO PREVENT SLIDING




THIS easily built equipment will provide the basis for a modern and healthful training program for future Commandos. Ideal for the camp or school, the various units are simple in construction, and carefully designed to develop the utmost in physical skill with a maximum in safety.

The start of this "Ranger Course" consists of a cable or greased rope drawn semi-taut between two trees. The starting end is slightly higher than the other, so that the trainees will be able to slide along it. The spikes up the sides of the trees or posts should be driven either on




the sides of the trees or on the back, away from the cable. This keeps them out of the way of the participants, and eliminates all chance of catching clothes on spike heads.

Do not incline this cable steeply, lest the sliding speed be too high for safety.

From the cable obstacle, the junior trainees head for the 5-ft. plank fence. Note that the top of this fence is carefully rounded to prevent possible scratches to the hands of the participants. Since the entire Ranger Course should be made a competitive game on a time basis, it must be remembered that enthusiasm will take the participants along it at considerable speed, and so all precautions are taken in building it, in order to prevent mishaps.

When the plank fence (Fig. 2) has been scaled, the youngsters must traverse the "barbed wire." This is not really barbed, but merely straight galvanized wire or even cord, with small bits of yarn tied to it at intervals. The yarn is dusted with French chalk or other powder of similar nature, so that the participants will know, when the course is completed, if they have come in contact with the "barbs." This obstacle is illustrated at Fig. 3.

The next step in the course is the ladder bridge, which must be traversed as illustrated (Fig. 4). The ladder is supported above the ground by a number of uprights, as shown. The height of the ladder should be gauged in construction of the unit, so that the youngster's feet will be only a short distance above the ground. It is important that the feet clear the ground completely, but that no appreciable drop be necessary in the event of failure of the participant to successfully negotiate the "hazard."

Fig. 5, the next step along the way, is simply a large concrete pipe. The youthful trainees must crawl through this in order to reach the series of boxes shown in Fig. 6.

The boxes (Fig. 6) are designed to develop co-ordination of the leg muscles to the nth degree. These boxes are built up of wood, and should be rounded on the top to keep the less sure-footed of the contestants from skinning their shins.

The log bridge shown in Fig. 7, is the next stage in the course. Its purpose is that of improving the contestant's sense of balance, and to permit him to exercise it fully.

Next come the [*Continued on page* 144]

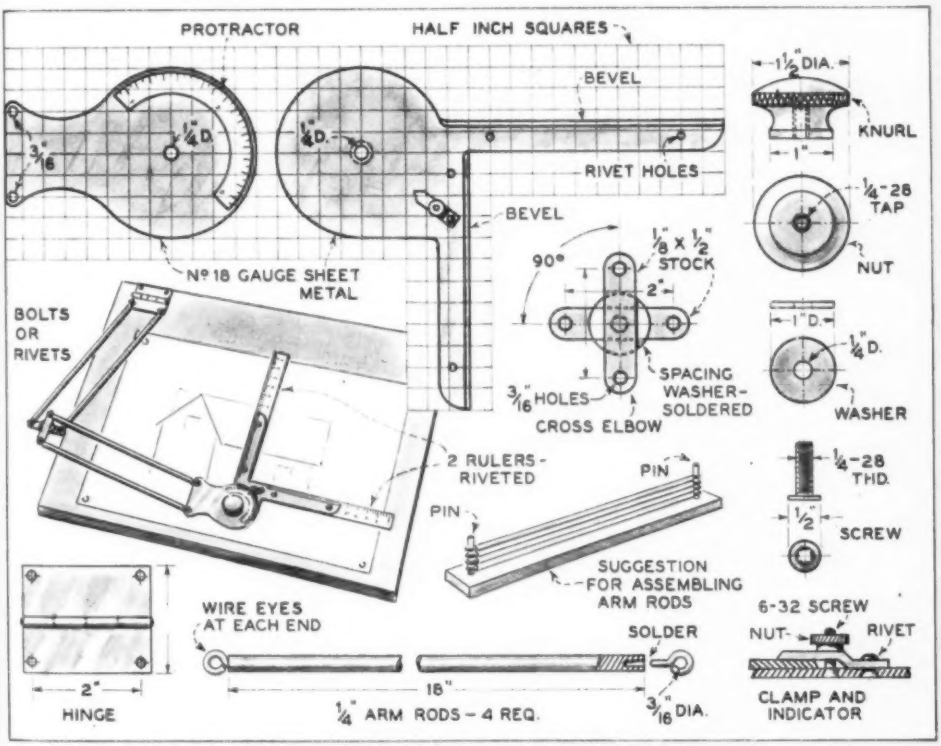
# DRAFTING MACHINE

DRAFTING machines are now used extensively by large and small concerns alike, particularly in war production work, where a great deal of drafting is necessary. These machines eliminate T squares, triangles and protractors, performing the functions of all three, thereby saving time in drawing. Essentially, a drafting machine consists of two rulers, one vertical, the other horizontal, fastened to a 90 degree angle attached to a protractor plate. A control knob in the center of the plate is turned to obtain the desired angle. The machines are fairly expensive to buy, if any can be found for sale, but the student or craftsman can easily make a fairly efficient one. It won't have the hairline accuracy of a factory job, but will give satisfactory results, particularly where beginners are concerned.

The machine illustrated below is composed of four arms, hinge, cross elbow, steel or celluloid protractor and two steel rulers. Materials needed, in addition to the above, include a machine screw with knurled clamp nut, bolt and round head nut and a piece of 18 ga. sheet metal measuring 9"x18". Study the drawing carefully and follow dimensions closely for good results.

Lay out the protractor pattern, exactly as indicated, on the sheet metal and carefully cut and drill. Use a master right angle as a guide to be certain of accuracy in cutting the arms that will hold the rulers.

When all parts have been made up as shown, assemble the drafting machine with rivets, getting them fairly tight, but allowing enough play so the arms will move easily. Attach by hinge to drawing board.—W. L.




This drawing gives all details and dimensions of the drafting machine. Use care in making the various pieces and you'll have a fairly accurate drafting tool.

# THE SCHOOL SHOP

Conducted by Gilbert Paust

*Ground Instructor and Lieutenant, Civil Air Patrol*

Here is a photo of the control tower at Salt Lake City municipal airport. It issues information and instructions to planes to regulate the flow of air traffic in the vicinity of the field.

## Lesson 5: Safety of Modern Flying

IT IS a very sad but true fact that there are STILL some people in this world who refuse to believe that the airplane is here to stay. They read in the papers about the achievements of our military planes, take a ride now and then in an airliner when they absolutely have to, watch the lightplanes at the near-by airport—but when it comes to actually piloting a plane themselves, not on your life! And why? "I wouldn't risk my life in one of those things. They're too dangerous!" they say. Bosh! Flying is one of the safest methods of travel. We hear of crackups, of course, but the aircraft casualty percentage can't compare with that of the automobile. And I'll tell you WHY flying is safe.

This is the control tower at Newark Airport. Tower operator instructs planes by radio.—Photo from Western Electric Co.

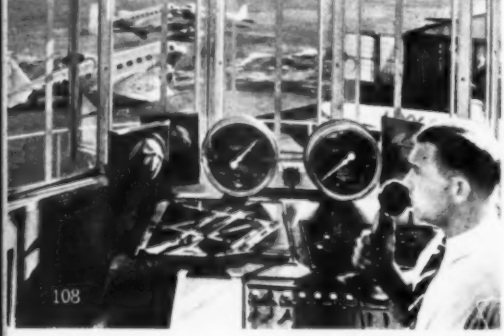
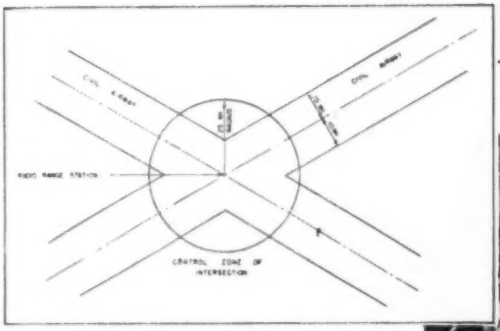


Photo *below* shows the interior of the Airway Traffic Control Center at Newark. Chart is used to show positions of planes.

Landings and takeoffs of all planes using the field are under control of tower.

*Below* is a drawing of a Control Zone of intersection of four converging airways.



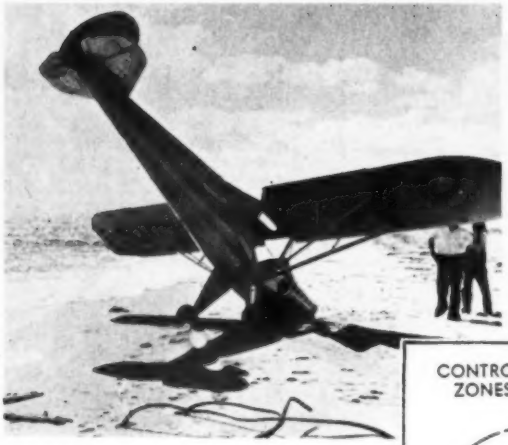

*Below* is a photo of a typical control airport. Arrow shows the location of the traffic control tower.

This photo is one of an auxiliary landing field. Airports such as these add to the safety of travel on Civil Airways.

Behind civilian aviation in the United States is a controlling system which completely regulates "from the ground up" every phase of civilian flying. It is the Civil Aeronautics Authority. Created in 1938 and revised in 1939, the C.A.A. was designed to promote safety in aviation—and it has. It concerns itself with the control of air traffic, competency of pilots and mechanics, airworthiness of aircraft, inspection of all planes, investigation of accidents, and many other related items too numerous to mention. Its rules are rigid and are strictly enforced. Penalties for their violation range from revocation of a pilot's certificate to $5,000 and 5 years in jail.

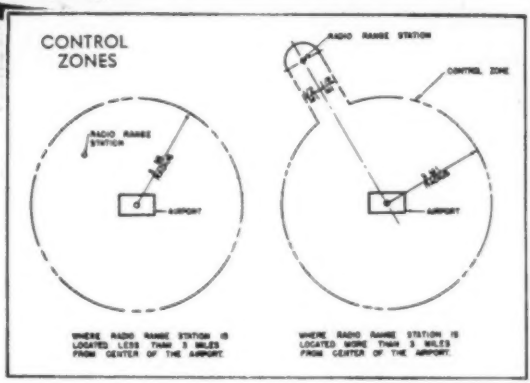
Beginning with this lesson, we are going to start a series of studies of these safety regulations and when we have completed them, many of you will be surprised at the rather complex but completely effective method which controls every plane and pilot who take to the air. Moreover, you'll have to know them if you ever hope to qualify for any type of pilot certificate.

First of all, let's take a look at the



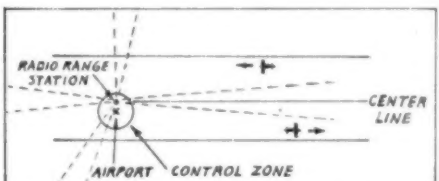
Number of accidents in civilian flying is decreasing. C.A.A. has made flying safe.

Diagram *below* shows size of control zone and positions of radio range station and airport.




parkways and the traffic police of the air. Never heard of them? Well, they're a fact just the same. Stretching through the air above the surface of the United States is a network of air parkways, designated by the Administrator of the C.A.A. and called *Civil Airways*. These airways connect all the major airports of the country. They are named by number (as are automobile routes) and also by color. The colors are: green, amber, red and blue. For example, Green Airway No. 4 extends from Los Angeles, California, to Philadelphia, Pennsylvania, passing through numerous airports on the way.

Civil Airways are twenty miles wide. Running through the center of each, parallel to the sides, is a *center line* which connects




*Above:* Zone on airways. Traffic keeps to right.

radio broadcasting stations of special type called *radio range stations* which send a directional radio beam along the airway to aid the pilot who desires to navigate by this method. When flying "blind," this beam guides the pilot along the airway. Just as an auto must keep to the right side of the road, a plane must keep to the right side of the airway.

Some Civil Airways are under direct supervision of the C.A.A. These are named *Control Areas* and the traffic on them is regulated directly by *Airway* [*Continued on page* 144]

Night lighting of airports has contributed greatly to the safety of night flying on the Civil Airways.

To determine your height, line up sighting pins by moving block. Line on transparent strip attached to under side of block will then point to your height on the calibrated strip.

**Add fun to your parties with this amusing gadget.**

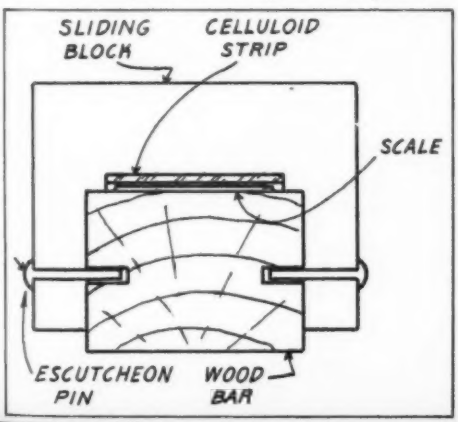
# "HEIGHTOMETER" FOR YOUR HOME

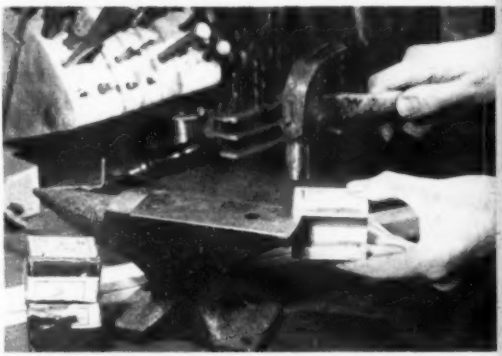
MERELY by sighting across two pins, you can tell how tall you are with this easily made "heightometer." The device, which is mounted on a wall, is both useful and amusing, and makes an interesting addition to a recreation room. The instrument consists of a vertical wooden bar carrying a scale calibrated in inches and feet; and a sliding block having a pointer or index line and two pins acting as sights.

Cut the bar from white pine or poplar, to measure approximately ¾ by 1 by 18 in. Near each end bore holes to receive wood screws, and counterbore them so the heads will not protrude above the surface.

The sliding block is made of maple or birch, shaped as shown. Through each side, two pins project into a groove in the edge of the bar. These are [*Continued on page* 142]

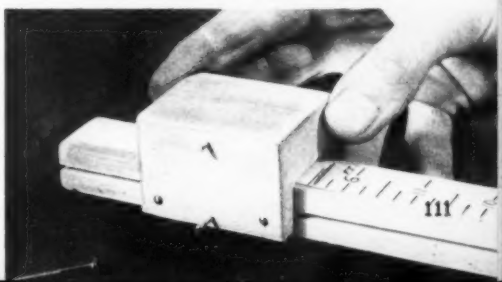
Section of calibrated bar and sliding block of *heightometer*



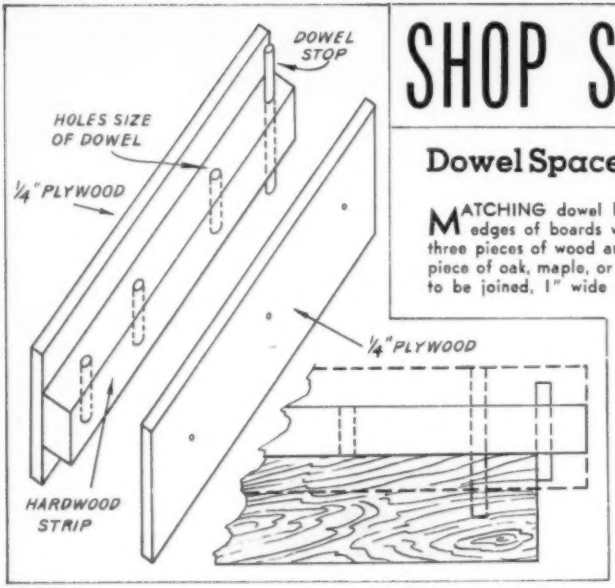



Brass escutcheon pins with blunted ends are driven for guides.

Transparent pointer strip is cemented to block as *above*. India ink line on strip serves as pointer *below*. Note sight pins.



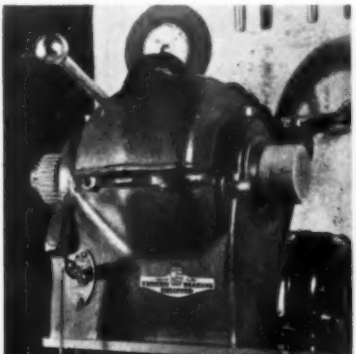
# SHOP SHORTCUTS

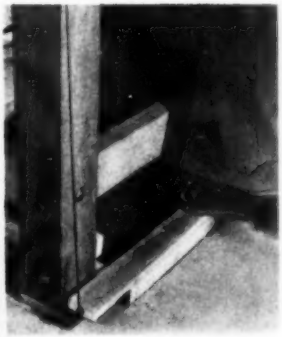


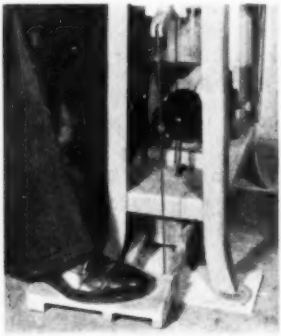

## Dowel Spacer Assures Neat Work

MATCHING dowel holes can be bored accurately in the edges of boards with the aid of a template made from three pieces of wood and a 2" length of dowel rod. Obtain a piece of oak, maple, or birch the exact thickness of the boards to be joined, 1" wide and 18" long, or as long as the work requires. At intervals where dowels are to be placed, bore holes the size of the dowels. About 1" from one end, bore an additional hole to receive the 2" length of dowel rod, each end of which projects ½". Fasten this piece in place with glue or a nail. Take care to center all holes carefully with respect to the edges, and bore them straight. Cut two strips of ¼" plywood or similar stock as long as the hardwood piece and 2" wider. Nail these to each side of the strip as shown.

[*Continued on page 138*]







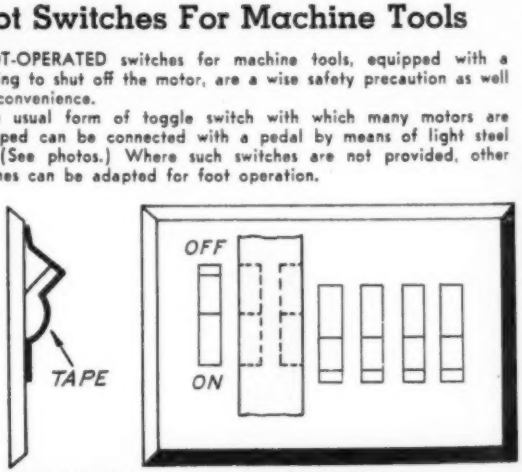
## Foot Switches For Machine Tools

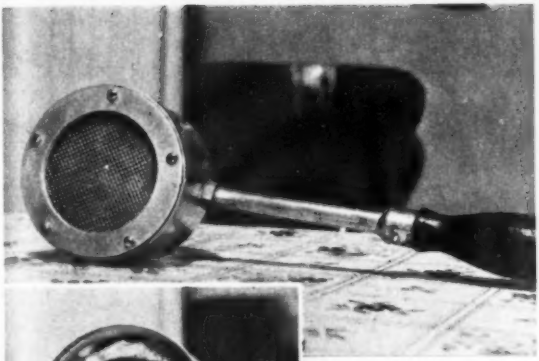
FOOT-OPERATED switches for machine tools, equipped with a spring to shut off the motor, are a wise safety precaution as well as a convenience.

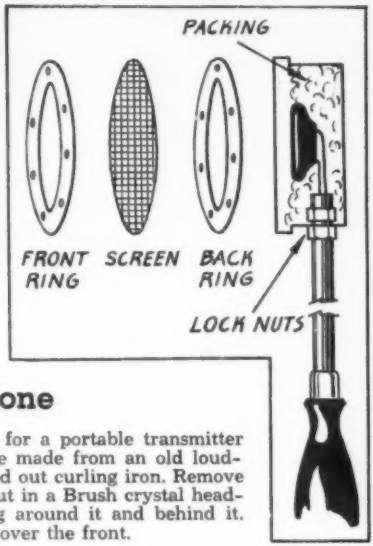
The usual form of toggle switch with which many motors are equipped can be connected with a pedal by means of light steel rod. (See photos.) Where such switches are not provided, other switches can be adapted for foot operation.

## Tape Blocks Out Switches

IT HAS been found convenient with large gang switches of the toggle type to tape in the following manner those toggles desired to be inactive: Position the toggle, then apply adhesive tape tightly, from one side of the switch plate, up over the toggle to the other side. This method saves needless fingering of the inactive toggles.

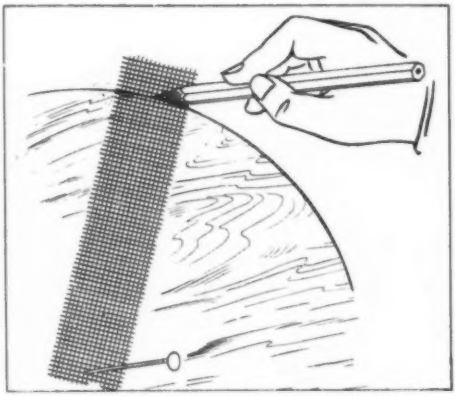







## Hand Microphone

AN EXCELLENT mike for a portable transmitter or P. A. work can be made from an old loudspeaker unit and a burned out curling iron. Remove the speaker works and put in a Brush crystal headphone unit, with packing around it and behind it. Place a screen and cloth over the front.

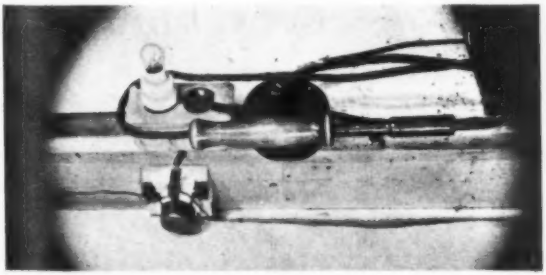


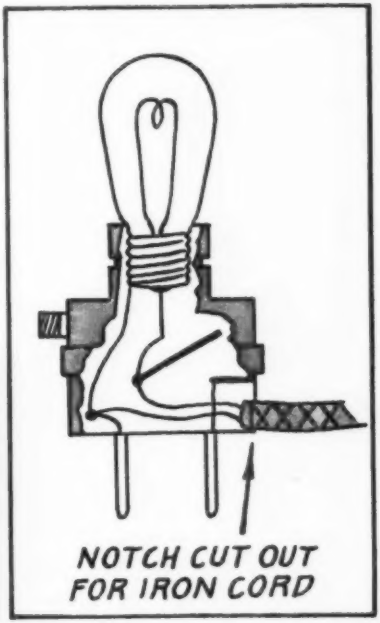
## Workshop Compass

SAVE a scrap of old screen wire to use as a handy workshop compass. Quickly adjustable by moving the pencil point from one hole to another, the compass can have a nail or other sharp pointed instrument as the center.

## Soldering Iron Pilot Light

IT'LL be impossible to walk away and forget to disconnect the soldering iron after using it if you'll take a few minutes' time to make this simple pilot light. A small night light from the five and ten cent store is wired into the lamp circuit behind the switch.



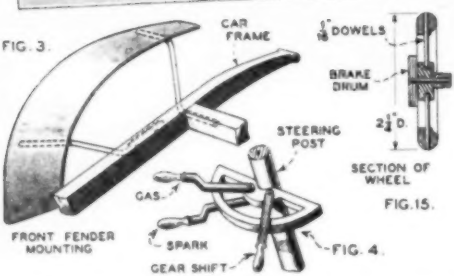


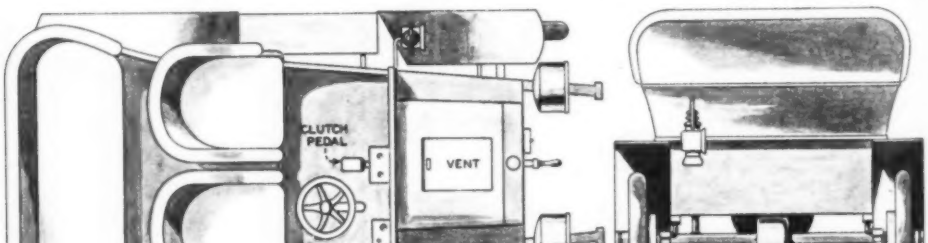
# DARRACQ TOURING CAR OF

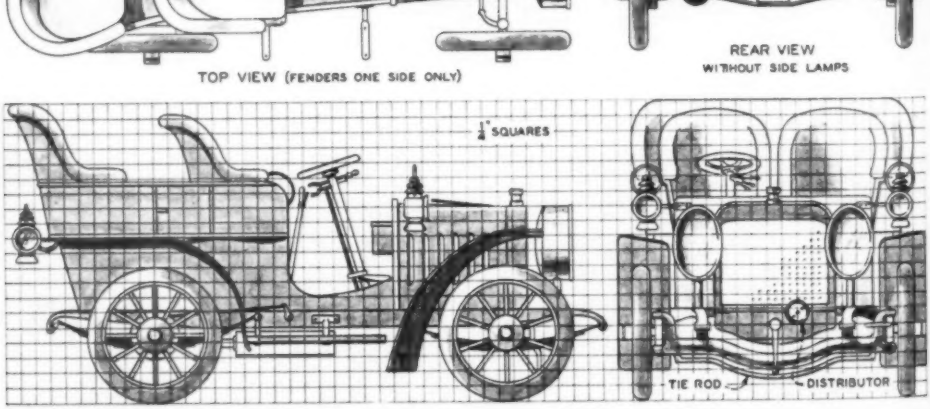
by Hi Sibley

AT THE turn of the century France was far ahead of this country in automobile design, mechanically as well as in appearance. American motor cars still retained carriage lines, engines were one or two-cylinder located beneath the seat, with single chain drive. Imported cars had placed the motor forward, easily accessible under a hood, transmissions gave three or four speeds and drive was by double side chain or shaft and gears. They had, however, one disadvantage for American use; designed for the smooth paved roads of Europe they had very little clearance; like Napoleon's army, they very nearly traveled on their bellies, and flywheels literally dragged in the mud on our country highways.

The workmanship, nevertheless, was almost like that of a watch and there was much fine hand work, though no mass production as we

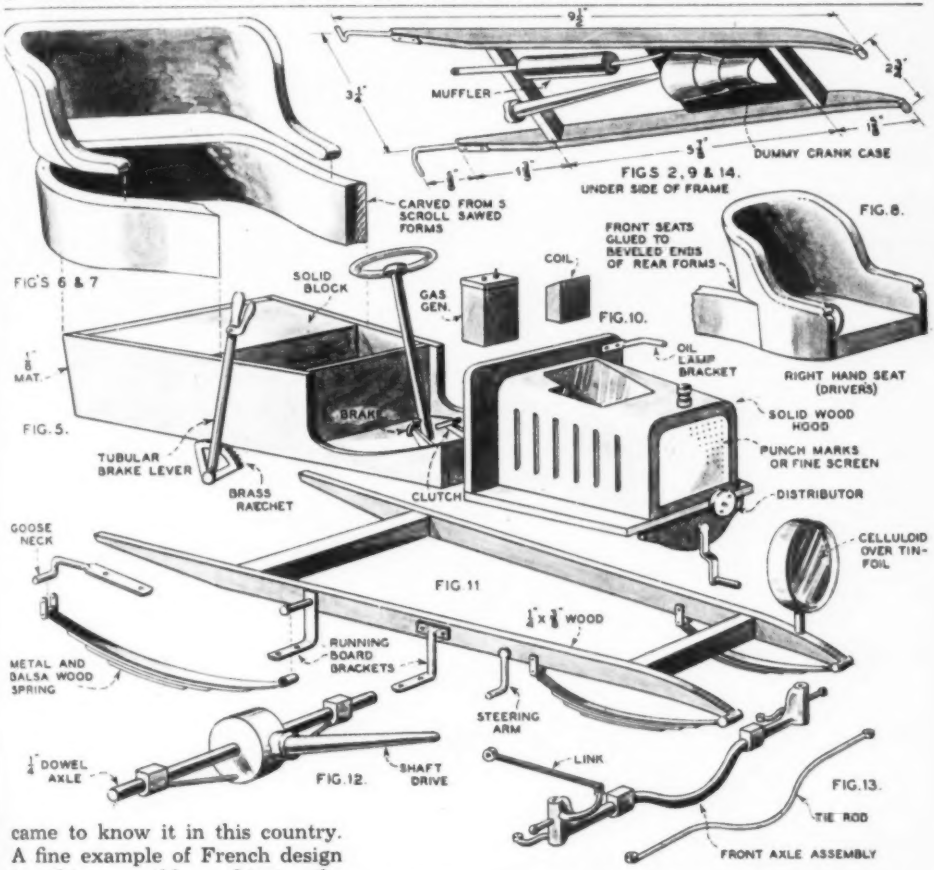


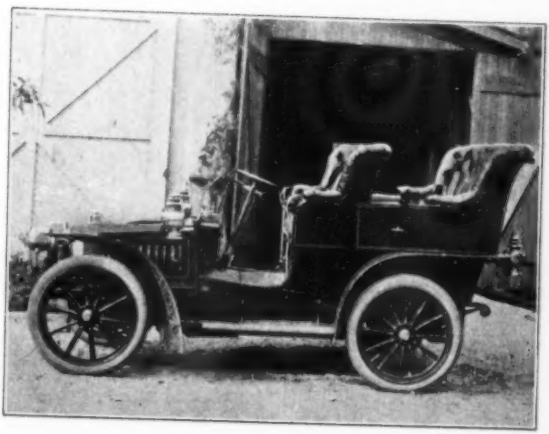
# 1904

**We turn to France for the subject of our third article on models of early automobiles.**

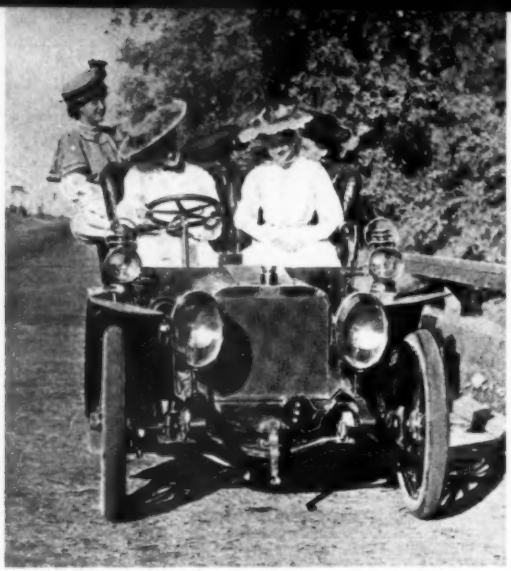



came to know it in this country. A fine example of French design is this month's subject, the Darracq of 1904, embodying the most advanced development of European engineers. It is known as a touring car, with high-backed, luxuriously upholstered seats. Entrance to the tonneau was gained by swinging the left front seat outward on a pivot.

General over-all dimensions are given in the four views in Fig. 1. Note that there are twelve spokes in the rear wheel, ten in



*Right:* A French Darracq 4-cylinder touring car of 1904 vintage. This was the last word in design and mechanical principle at the time, and was superior in workmanship to American automobiles. Entrance to the tonneau was made via the front seat, which swung out on a pivot (see the photo at top of the opposite page).



Huge, costly oval acetylene headlights distinguish this handsome car, the swankiest thing of its day. The meager road clearance put it at a disadvantage on American country highways. Study this excellent front view carefully. It will help you in making your model.

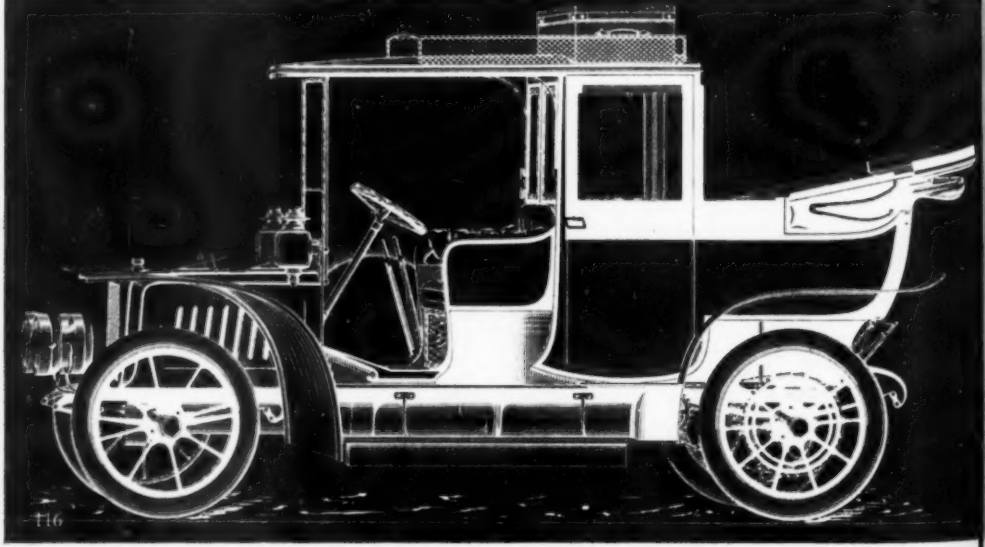
the front. This is in line with the absence of parts interchangeability of foreign, individually built automobiles. Also you will observe that the tie-rod and crank clear the road surface by only four or five inches.

As in the preceding models, this is an all-wood project with the exception of small parts, such as main spring leaves, levers, quadrants, fenders, brackets, steering wheel, tie rod, arms and link, goosenecks, etc.

Start with the chassis frame, Fig. 2, to assemble on. This is made of hardwood, with stiff wire goosenecks in back, and drop ends in front. The fenders are supported as shown in Fig. 3, but should not be installed permanently until the wheels and axles are on. In Fig. 4 are the controls located under the steering wheel, and should be made of brass or steel, fashioned on the vise with file and drill.

The main part of the body is built up of ⅛-in. material, secured with casein glue and small brads, as in Fig. 5, under the rear. Seat and floor board are solid blocks. Brake lever with ratchet is installed as shown, and the steering post and wheel rise from the floor board. Steering wheel is a wire ring with five-spoke, brass spider. Brake and clutch pedals may be carved from wood, or filed from pieces of brass and soldered. On top of the body rest the curved sides and back of the tonneau (Fig. 6), scroll-sawed from a single block and shaped with jackknife, chisel and sandpaper. This is surmounted by the seat back, Fig. 7, which requires a neat bit of wood carving to achieve the graceful shape. Instead of attempting upholstery, with buttons, as in the original in the photograph, leave smooth to [*Continued on page* 140]

After American automotive engineers had developed cars that were fairly dependable mechanically they began to give more attention to body design, and followed French lines insofar as they were adaptable to our conditions. Plate *below* was taken from a group of French designs used for reference by American designers at the Pope-Toledo Company.

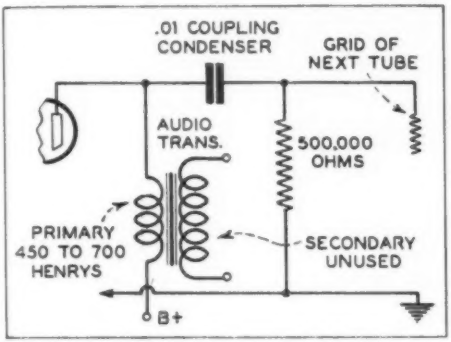


# RADIO KINKS

## Pre-Amplifying Receiver

THIS little gadget will actually boost the signal strength to a small broadcast receiver without the use of an additional tube. It can be made from simple junk-box parts and is practically costless. Mount it close to or on the receiver chassis for best results.

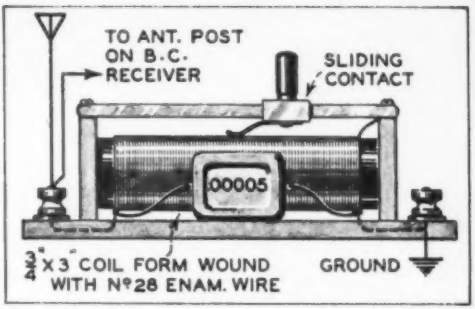
Wind a ¾" diameter form with No. 28 enameled wire for a length of 3". Then carefully clean the enamel off for a width of ¼" the length of the coil. Arrange a slider as shown that will [*Continued on page 144*]




## Temporary H. V. Condenser

WHEN in dire need of a high voltage filter condenser you can fashion one from an old but good 6 volt storage battery as shown in the accompanying sketch. Choose one in which the plates are not buckled.

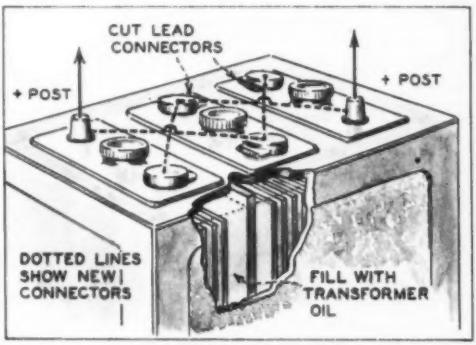
Wash out the battery thoroughly, then reconnect cells in parallel. Fill the cells with transformer oil and you have a condenser that will withstand at least 1,000 volts.

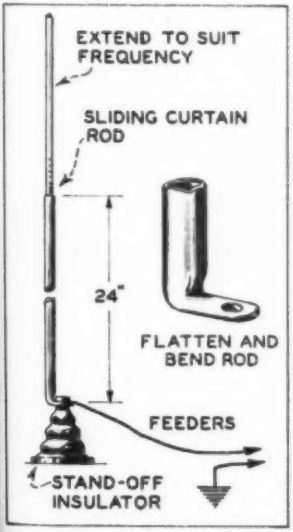



## Coupling With Transformer

IF OCCASION calls for the use of a screen-grid tube detector in place of a triode in an old style receiver it is unnecessary to remove the first audio transformer to use impedence coupling. Simply use the primary of the transformer as indicated in the diagram.

With these values the transfer of energy to the first audio will be sufficient and, using the screen grid detector, will be better than with transformer coupling.



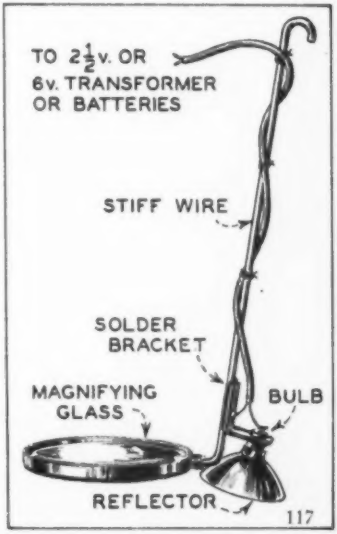

## Curtain Rod Antenna

A FINE ultra high frequency antenna can be made from a brass or brass plated sliding curtain rod of suitable length. For 2½ and 5 meters choose a rod that closes up so its entire length is not over 25" and will expand to 5'.

Bolt to suitable insulator.

## Set Servicer

FOR the service man or the amateur who appreciates how difficult it is to explore a radio under dark or obscure conditions, this [*Continued on page 144*]



# GRUMMAN AVENGER

Extreme realism is obtained in the solid scale model by inclusion of crew carved from balsa. "Bubble" gun turret revolves.

by Robert L. Brown

*Model Designed by Edmund Eggers*

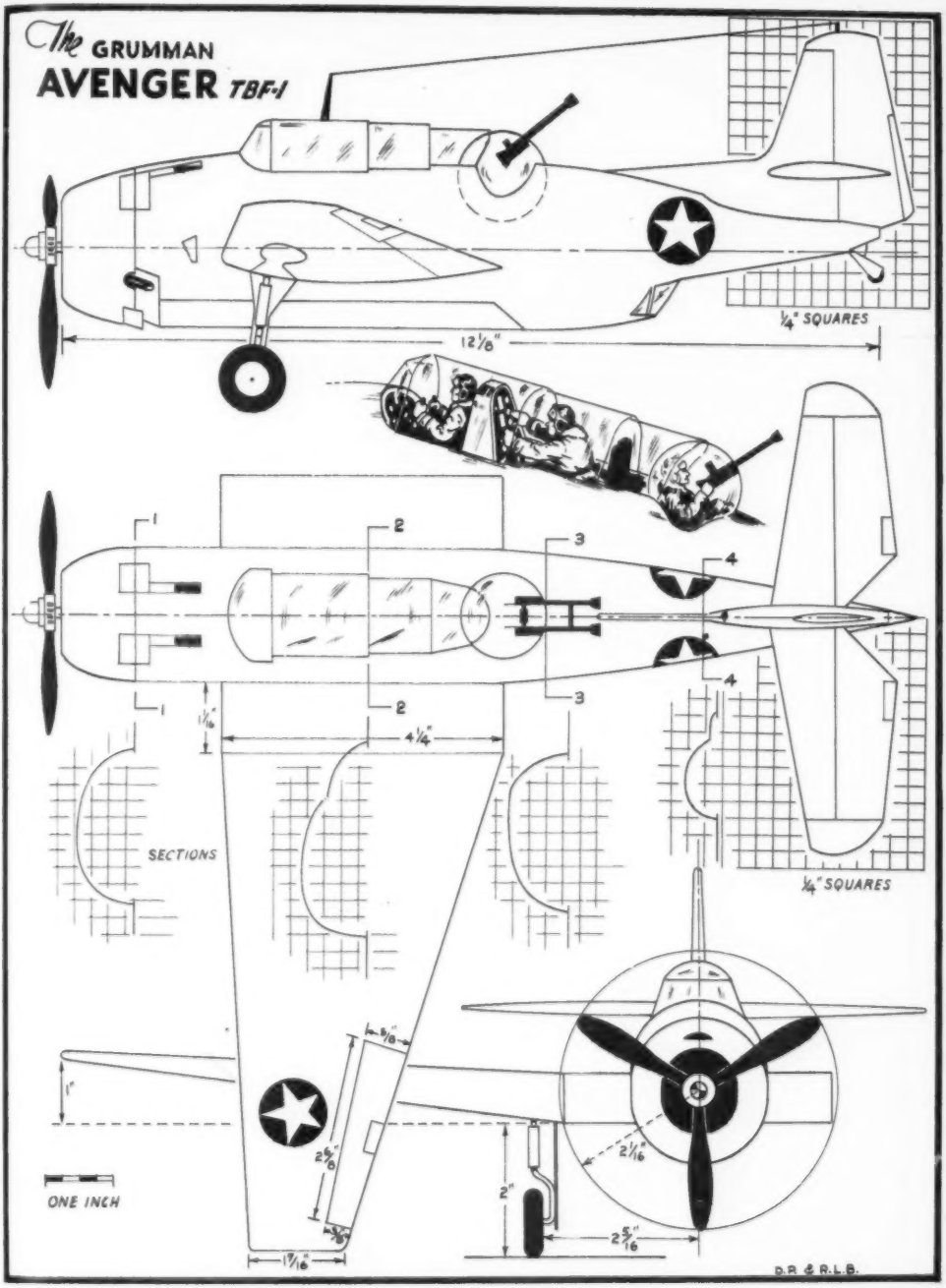
THE Grumman Avenger, impressive at the battle of Midway, also demands respect as a solid display model. It is not extremely difficult to carve a miniature crew of simple form. By studying the pictures of the model as well as the drawing, you can get enough details of the 3-man crew to carve replicas in balsa. This adds a great deal to the realistic appearance.

This highly detailed model not only includes all details of the enclosure, but even has a rotating rear turret. The rear gunner rotates around with the guns always being in position to fire. Edmund Eggers is noted out on the West Coast for his superbly finished models. Change Coordinator in the Engineering Department at Douglas Aircraft Company, he spends spare time turning out the amazing miniatures of the airplanes which are whipping our enemies.

One of the most creditable and devastating ships ever produced is the Grumman Avenger, a plane which spells certain doom for aircraft carriers, to say nothing of its destructive power to other vessels. Every one has been agog over Eggers' perfect display model of the plane. The rotating rear guns make it possible to realistically pose the ship in combat by suspending it with threads.

Trace a side view pattern of the fuselage on a block of balsa, bass, or soft white pine of the correct size. After cutting the block on a jig saw, tack on the scrap pieces, glue or trace on the top view pattern and cut out this view, also. Cut out templates to check the cross-section shapes. Begin by trimming off the corners with a knife, plane,

[*Continued on page* 136]

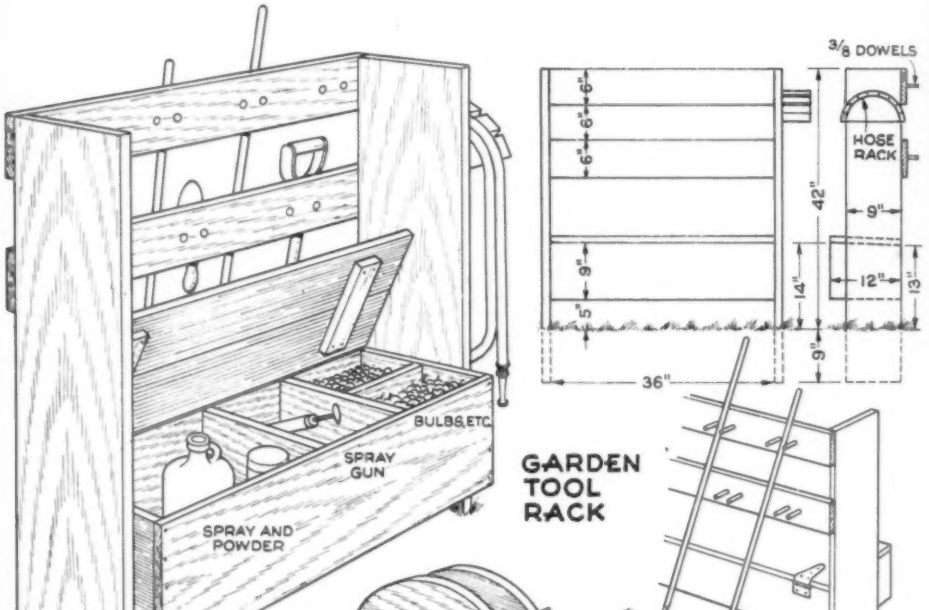



Dimensions and details of the Avenger model. Cut cardboard templates identical with the "sections" for checking fuselage shape as carving proceeds.

# IDEAS FOR THE

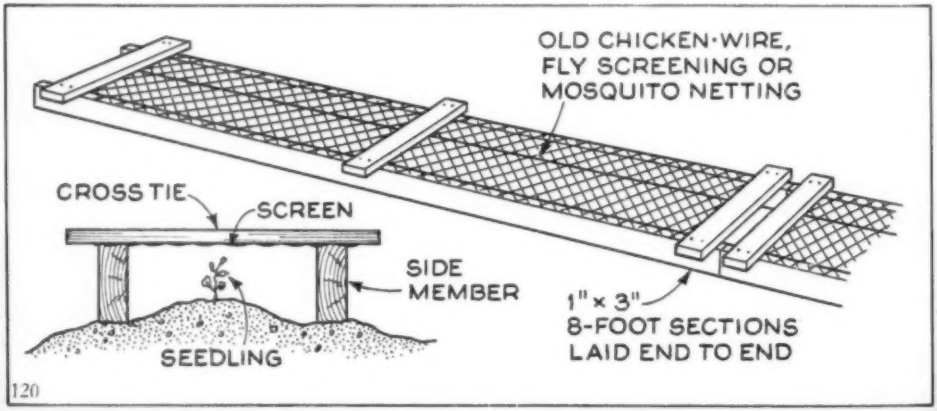
## Garden Tool Rack

THE tool rack illustrated below will be found a great convenience at the head of the garden, as it accommodates long and short-handled tools, hose, liquid sprays, bulbs and other items which should not be exposed to the sun. The seat lid is inclined, to carry off rain.



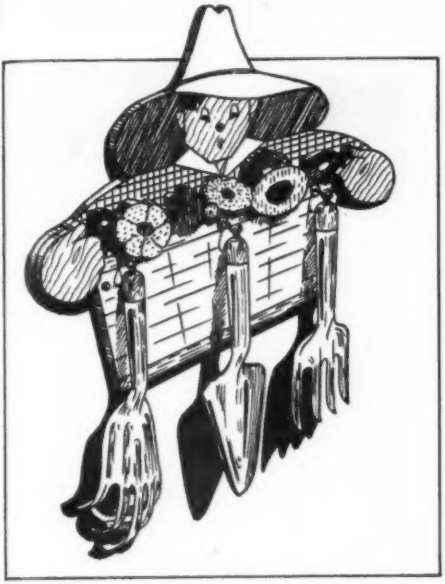

## Victory Bird Baffle

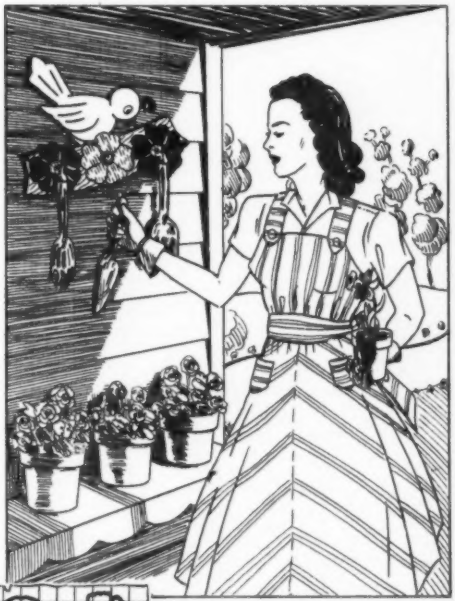
WHEN seedlings first appear above the ground, birds in many localities will destroy them. This protective screen will permit the plants to attain sufficient growth to survive. Birds will not bother the plants after the leaves become fairly tough.—*Hi Sibley.*



# VICTORY GARDENER

**Make your gardening more pleasant and efficient with these accessories.**

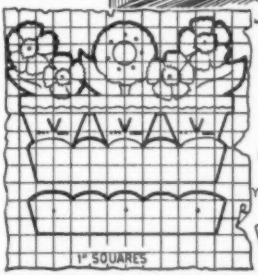


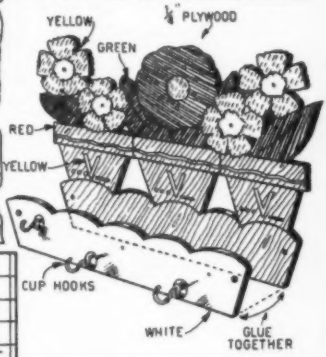


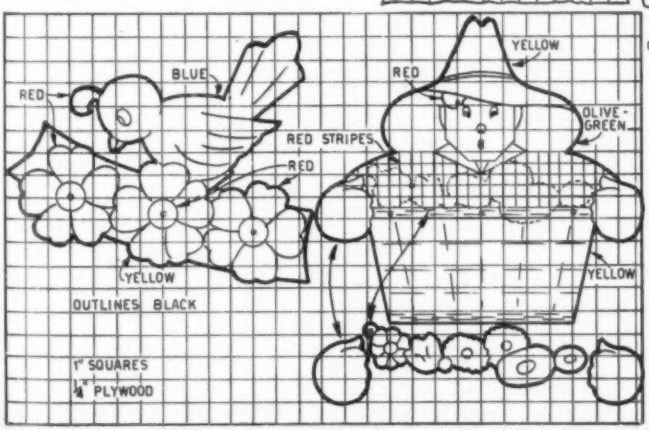
## Novel Hand Tool Holders

SMALL tools for your garden suspended from a plywood holder will add a bit of color and novelty to your patio or garden and keep these necessary items where they are handy to use.

To make each, trace the design to ¼" plywood and jigsaw out. The flowers and two hands shown in the design of the farmer holding a basket of flowers are cut separately and glued and tacked to the figure. Cup hooks are used to hang the tools from. Paint the holders in gay colors.—*R. Fairall.*

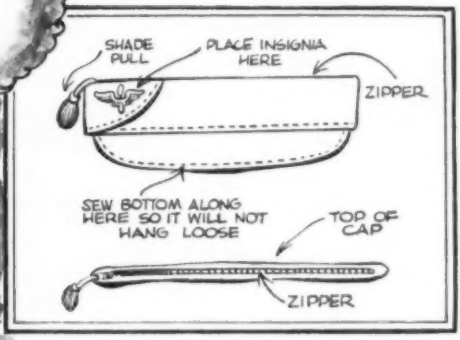



Patterns for the tool holders are shown *above* and at *left*, with bright color schemes suggested.

# IDEAS for SERVICE MEN




**From Private William C. Dick** of the Army Medical Corps, stationed at Chickasha, Okla., comes one of the best ideas for service men ever to appear in these hallowed columns. We predict great popularity for it, but hope it doesn't result in the wholesale disappearance of overseas caps from the Quartermaster Dep't.

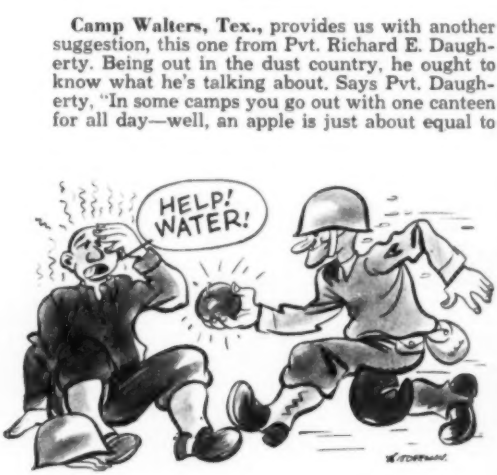
With the aid of a zipper and his Corps insignia, Pvt. Dick made a clever and attractive handbag for his best girl. He simply sewed the zipper along the "brim" of the cap, stitched the bottom to prevent sagging and pinned the insignia on the side, as shown in the sketch. A shade pull, or tassel, added to the zip grip completes the job. Now go to it, boys. The girls will love 'em!

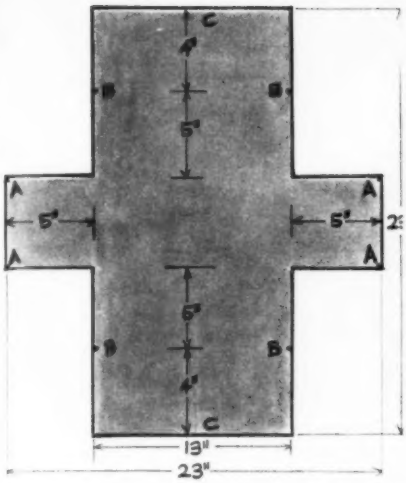
---

**"Men who have inspection officers** who are very strict about clean rifle bores," says Cpl. John J. Schwartz, Camp Walters, Tex., "will find that a little jewelers' rouge on the patch when run through the barrel will make the gun the envy of their company. Use rouge especially after firing on the range, for it will remove all carbon deposits quickly and easily."

---

**Camp Walters, Tex.,** provides us with another suggestion, this one from Pvt. Richard E. Daugherty. Being out in the dust country, he ought to know what he's talking about. Says Pvt. Daugherty, "In some camps you go out with one canteen for all day—well, an apple is just about equal to






SEW A to B FOR CORNERS OF BAG USING FRENCH SEAMS OR OVERCAST. SEW ZIPPER TO C .... SEW ENDS OF BAG GATHER OR PLEAT IN THE TOP. KEEP ZIPPER FLAT

half a glass of water—so, stuff a couple or three around in your pack; it helps." Any chemists want to check on this?

---

**Mrs. Gladys Bliss, of Durand, Ill.,** whose husband is in the Navy, sends us the next one. Using a heavy sugar sack that had been bleached, Mrs. Bliss made her sailor a handy shoe bag, as illustrated. The idea is to put the shoes in this bag, then put the whole business in the sea bag, thereby keeping both shoes and clothes clean and in good shape. To make it, follow the pattern and sew up per instructions on sketch.

---

**The RCAF is the source of the next inspiration,** and it comes from **E. E. Savage, of Toronto.** The idea is to cut down button, insignia, etc., polishing time, and at the same time keep the metal objects bright and shiny for several days. Method is simple. Just give your buttons a good manicure, then coat them with colorless (clear) nail polish. Polish keeps air out, prevents tarnishing.

**Pvt. Herbert Townley,** serving with an armored regiment in Pennsylvania, writes us a real doozy. He has a system for drying tables that will either make or break a man on K.P. After pouring the

[*Continued on page 140*]

**SERVICE MEN, ATTENTION!**

This is your department, and if you like it enough to want to make it better, you can. It's all up to you! Send in your ideas—anything you think may help your buddies in the Army, Navy or Marines. You'll be helping yourself too, because MECHANIX ILLUSTRATED pays from $2.50 up for material used. Address "Ideas for Service Men," MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

This is a photo of the San Juan Capistrano Mission in California. Built of adobe brick in 1776, it is still in good condition.

# MODERN HOUSES OF EARTH

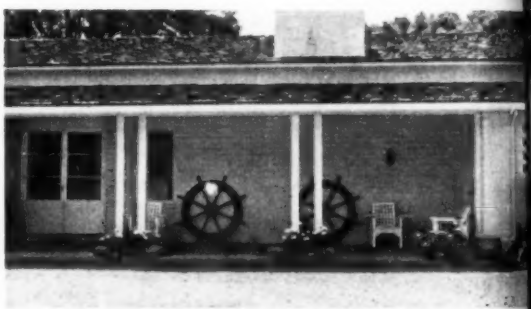
by

Richard W. Haupt

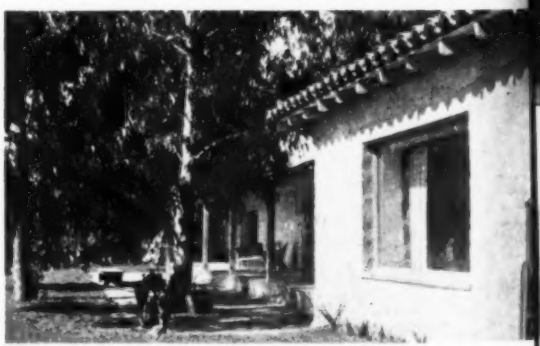
**PART IV (Concluded)**

SINCE the earliest of times man has used earth in various forms for the construction of his dwellings. American Indians of the southwest, for instance, built their houses of dried mud and clay, a mixture roughly similar to the "adobe" now used in modern California houses. The use of this material, in more or less its present form, was introduced to this country in the 16th century by the Spanish Conquistadors, who built their famous missions and other edifices from sun-baked adobe bricks.

In recent years up-to-date construction methods have greatly improved adobe brick construction, and the discovery that an asphaltic emulsion stabilizer could be mixed into the earth of the bricks, thereby rendering them moisture-resistant, has opened up the possibility of extending the



*Above* is a photo of a stabilized adobe brick house. Notice the adobe shingles used for roof covering and also the adobe floor of the porch. Such a house will stand indefinitely.

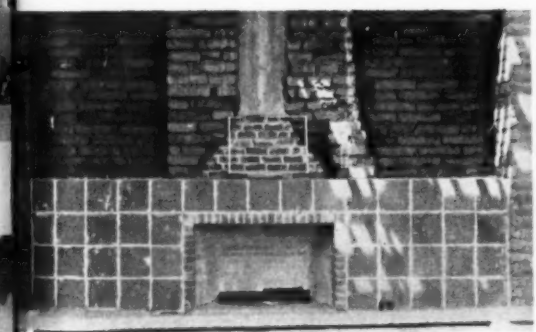


Here is another adobe house showing the large window in the wall. In this case tiles were used in the roof construction. Notice how rafters in wall support roof.

In the adobe house shown at the *left*, bricks were also used to make porch columns. These houses can be attractively finished. The walls closely resemble stucco.

At the *right* is a photo of an adobe house in the process of construction. Chimney is also adobe. Complete construction is explained in detail in the text

Photo *above* shows adobe bricks drying. House is in background. Some of the wettest bricks are covered with paper so fast drying in hot sun will not crack them.



This picture of the interior shows fireplace under construction. Details were described in Part II of this series. (April issue.) Inside of fireplace is lined with fire bricks.

range of use of this material further north and east.

Last month we described the making of an adobe "test brick," and outlined the requirements for a Federal Housing Administration loan on this type of dwelling. Drawings were included showing adobe brick construction details. If you have your May issue of MI handy, get it out and refer to it as we proceed now to the actual building of a modern adobe house.

### *Making the Adobe Bricks*

Find out the cubic foot volume of the walls by multiplying their thickness by their length and height as in rammed earth construction. From this figure subtract the cubic footage of the wall openings. Then subtract from this amount 25 per cent for the total volume of the mortar joints in the walls and you have the net cubic foot figure. If you use the standard size adobe brick 12"x18"x4", multiply the net cubic foot value by two and you will know how many of the standard ½-cubic foot adobe bricks you will need. Soil, however, compresses more when molded than it normally does in the ground, and about 25 per cent more than the net volume of the walls is needed. If you add to the cubic foot figure the sum deducted for mortar joints, the total will be about the number of cubic feet of soil needed.

Now you are ready to begin making bricks. The single mold which was made to test the soil may be used, but a multiple mold is more efficient. A mold making four bricks is the largest that one man can handle. The proper mold to use will depend on the size of your working crew and the way the soil is

At the *right* is another view of the fireplace. Notice the wooden flooring the concrete lintels over the doorway and the concrete cap on top of the wall.

At the *left* is a picture of a tractor and scraper used to pile the soil in preparation for making bricks. This method saves time which would ordinarily be lost in hand labor.

At *right* is the angular-shaped brick used in windows and doorways and the form which molds it. Notice dried bricks in background.

to be mixed. The molds are lined with light tin which keeps the soil from sticking to the inside. If unlined, the mold must be washed after removing the bricks.

If you want a brick 4" thick when cured, it may be necessary to make the mold 4⅛" to 4¼" deep, depending on the soil. Measure the thickness of your test bricks. As this test mold was 4¼" deep, it is easy to determine how deep to make your molds. A brick does not shrink in width or in length.

The angular-shaped mold makes the notched bricks used for holding the 2"x4" timber for the outside door and window frames. When these bricks are laid in an 18"-wall for window openings so that the angle is on the inside of the room, the window sills will be about 13" wide and will taper toward the window. Reversing this brick for outside doors provides a wide tapered doorway without weakening the structure.

A block of wood 3"x6" covered with tin and attached to the regular forms can be used to make notched bricks for doorways and windows if the special angular brick is not desired.

When the forms are made, count the number of bricks needed to vertically "block in" the doorways, windows and other wall openings. Half of the bricks needed for these wall openings should be molded one-half the size of the others. The laying of a half-size brick on top of each standard-size brick for the wall openings will make the proper bond lap for the succeeding courses of bricks in the walls. A piece of wood as thick and as wide as the form can be covered with tin and fastened temporarily to the form for molding these half-bricks. [*Continued on page* 146]

LT. RAWLINGSON'S

# One Shot

IN GREECE, a weary British rearguard slogs over a bridge of the Corinth Canal. Engineers remain to lay demolition charges. Before they can be fired, German parachutists shower down, seize the bridge. Engineer Lt. Rawlingson escapes, hides in a hole. The Germans search frantically for the hidden TNT. Suddenly, Rawlingson spies one of the distant detonators—no larger than a cigarette, hanging by the connecting wire against the gray stone of the bridge. Raising his rifle, he sights carefully—fires! A deafening roar. Bridge and Germans fall, a tangled mass, into the Canal. The British trudge on toward their ships—*saved by a rifleman.* (This is a true story, except for the rifleman's name, from the September 1942 issue of The American Rifleman.)

**IVER SINCE** rifling turned guns into deadly precision instruments, the trained rifleman has been the backbone of the army.

Our own history, especially, has been the history of men who shot faster and straighter than their foes. But America is no longer "a nation of marksmen"—*less than 2% of inductees know anything about rifle arms.* That is why fire-arms manufacturer O. F. Mossberg & Sons, Inc. urges *all* owners of .22 calibre rifles to . . .

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**A few more ideas for converting old pieces of furniture into new, modern designs. It's easy.**

# New Furniture Fr

Part III

IF YOURS is an average household, you certainly have some old furniture lying around the house which has been in the family for years and which you have gotten so sick of that many times you have considered tearing it apart piece by piece, or simply throwing it out the window and replacing it with some more pleasing to the eye. That old dining-room set, for example, which was given to you as a wedding present years ago—it's still useful, it is true, but surely you don't want it cluttering up the cellar until it reaches the "antique" stage. That old desk which has seen better days, that end table with the legs which have slipped their

This handy set of shelves resembles only slightly the original piece shown below.

Mirror used was oval but any shape is suitable. Remove from frame and make a back at least ¼-inch thick. Sandpaper frame.

# From Old

by Charles and Bertram Brownold

moorings, and the discarded radio console which at one time carried the best set on the market —you can't hold on to them forever! But still, you maintain, they're too good to throw out.

Well, you don't have to throw them out! With little effort you can convert them into writing-desks, book shelves, plant stands and numerous other articles which would add to the beauty and attractiveness of the most modern apartment. All you need is a little imagination, a few tools and a couple of cans of paint.

This is the third article to appear in MECHANIX ILLUSTRATED on this subject. In the two previous issues there was discussed the construction of a magazine rack, a hall shelf, an umbrella stand, a plant stand and a double-duty desk—all made from discarded furniture. In this

Here is the finished mirror-top table. Photo *below* shows the original model.

Shelves may be attached to the wall to hold plants, books and bric-a-brac. Two small drawers will hold pencils, stamps, etc.

# REMODELING FURNITURE

For shelves, legs were sawed off just below square section. At *right:* Paint was applied with the spray attachment of vacuum cleaner.

issue the authors will tell you how they made a mirror-top table and a set of ornamental shelves with drawers. After trying one of these projects, you'll realize all the possibilities at your disposal and doubtless work on a few ideas of your own. If you're one of those extremely fortunate individuals who have no old furniture lying about, a trip to the nearest charity organization depot will net you all the material you need for next to nothing.

The set of shelves described in this article was made from an old lectern of the type used in some churches as a reading desk. The following were all the changes necessary for its conversion.

The top was removed by sawing through the legs just above the second square section on each. The middle shelf thus became the top. The sawed off square ends were then finished by the addition of small pieces of ¼" plywood and small blocks with rounded edges and corners. The blocks were of soft wood and easily shaped on a sander, and were both glued and nailed in position with finishing nails. [*Continued on page* 142]

Crack-filler was used where necessary after unit had been assembled. Photo at *right* shows varnished legs being sandpapered before painting.

Most mirrors have back pieces too thin to use for a sturdy table. Such a back is shown in photo at *left*. Do not scratch the mirror when removing.

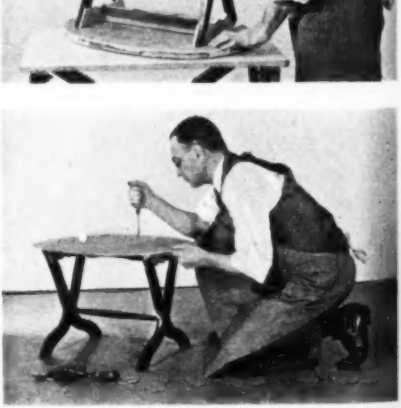


Table top is secured to legs by means of screws as at *right*. Screwheads are countersunk to prevent scratching of mirror.

# Your Wartime Car

by Frederick C. Russell

*If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply.*

## *Try it!*

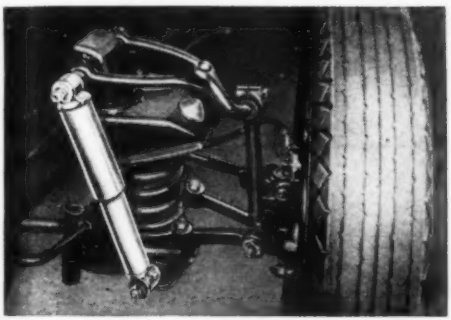
If you're planning a motor overhaul be sure to protect the cylinders against having loosened carbon work down to the upper rings. It's just a matter of squirting a little heavy oil over the piston tops before starting to scrape the carbon loose. The oil forms a protective seal.

**Although I have a new seal there still is leakage of oil around the timing gears. J. M.**

The oil return holes may be clogged.

Does an oil filter save oil or just clean it? H. B. E.

*If the filter is mounted outside the engine it may act as a cooler and cut down oil consumption in summer.*

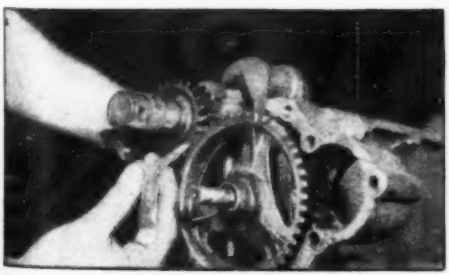


Recently I have noticed a tendency toward hard steering. Checked the gear housing and found it tight enough. Everything is well greased. L. S. N.

*Everything? How about the easily overlooked steering idler arm on this job?*

**After my car has stood all night I can't start without being towed. Have spent plenty on repairs, but the trouble hangs on. B. M. N.**

Check for a leaking carburetor bowl or a leaky cylinder head gasket.



Do coil springs need any special care? S. N. L.

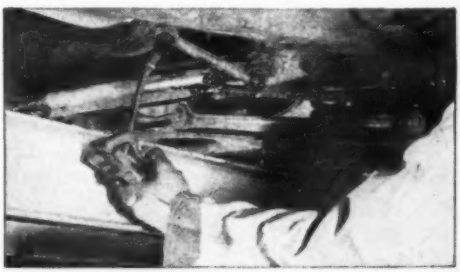
*It is effective to make sure that the shock absorbers are in good working condition. Their efficiency retards weakening of the coils.*

**Does foaming of the radiator water indicate a small crack in the engine block? E. O.**

Not necessarily. There might simply be a clogged fuel pump.

**Why is it that the engine of my car idles smoothly only with the adjusting screw well out to increase richness of the mixture? C. I. M.**

Suspect ignition or valve trouble. A very rich mixture often will cover up such trouble.



When installing new timing gears how do you know that they are meshed in their right relation? Wm. T. L.

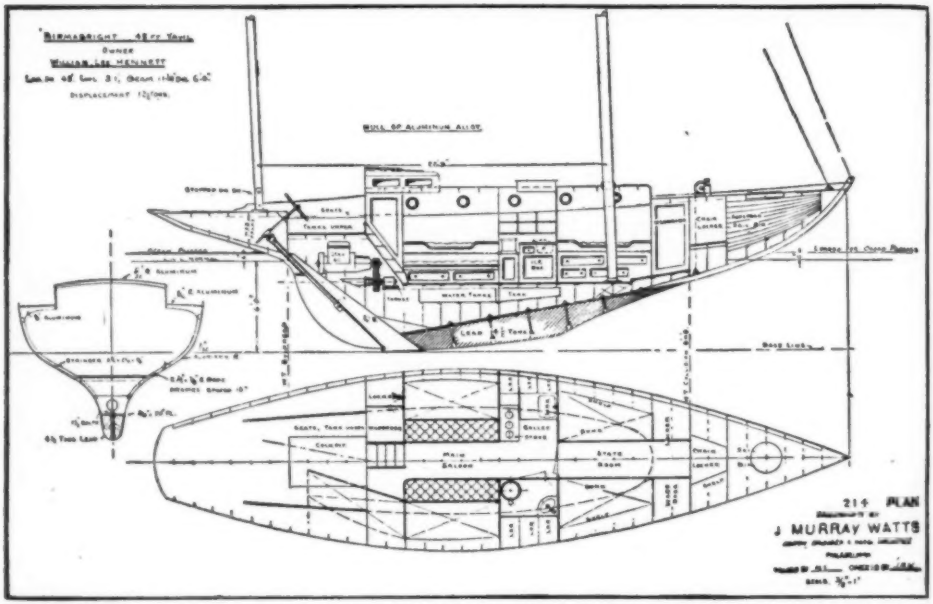
*They are always marked. You set the gears so that the marks come together.*

**My car has gone 15,982 miles. Should I have the shock absorbers refilled? G. L. P.**

No, on your make of car you shouldn't do anything to the shocks unless there is a known failure.

# Your Post-War Boat

[*Continued from page* 65]




In the sailing field, chief changes are likely to come in hull, rigging and fitting materials. *Above* is plan for 45-ft. yawl made of "Birmabright," a lightweight aluminum alloy that resists corrosion even in salt water. J. Murray Watts, N. A., was designer.

triple after the war, and result in greatly increased demand for all types of small craft. Despite this, and regardless of new materials and production techniques speeding up the turnout, the fact remains that boat building will always stay more or less in the handcraft field. Costs will, of course, be lowered, but mass production in the automobile sense won't come to pass, even though men like Henry Kaiser can squeeze out a cargo ship a day by wartime emergency methods. The cost of such production is far too high to be practicable in peace time.

Let's see what a few of the country's leading boat manufacturers and designers have to say on the subject of post-war pleasure and commercial craft. MECHANIX ILLUSTRATED has polled them, and their answers are highly interesting. Frank Pembroke Huckins, president of the Huckins Yacht Corp., producers of Navy PT boats, has this to say:

"Whether or not there is a considerable market for pleasure cruisers after the war will depend on the number of years it takes to win the war, whether our boat-minded citizens save their money during the war, and whether there is economic collapse or a cycle of business prosperity following that victory. Granting that there will be a market, the demand will unquestionably be for faster boats, of lower first cost and lower operating cost than hitherto existed. Despite their apparently conflicting characteristics, these demands can unquestionably be met. Development in the field of waterproof molded plywood and light metals together with experience in producing Motor Torpedo Boats with their record-breaking speeds, carrying heavy loads of armament, points the way to hulls of a fraction of the weight of pre-war boats. Such craft will plane largely on top of the water with a stability, dryness and efficiency never before known. Cruisers of that type can be easily propelled by automobile motors. It is also likely that a small diesel, for truck and farm implement propulsion will appear after the war and can be utilized, with great economy of operation, for powering these light cruisers."

This is very illuminating in view of the fact that Huckins was the designer of the fastest seagoing cruising yachts of the pre-war period, and is today one of the world's top-notch small boat authorities.

Brief but significant comment comes from A. M. Deering, Chicago naval architect: "The rapid development taking place in small combat vessel designs, incorporating plywoods, plastics and molded construction will, unquestionably, have its effect on post-war designs, covering both large and small vessels."

The post-war ideas of Andrew Jackson Higgins, president of Higgins Industries, are portrayed graphically in the Eureka News Bulletin, official publication of the organization, and furnish the basis for several of the illustrations accompanying this article. Higgins is planning a system of amphibian freight transportation for countries

[*Continued on page* 158]

# EVINRUDE POWER for Swift Storm Boats



"Storm Boats" they're called . . . these slashing little hurricanes of power and speed. They can float in mere inches of water. They can weave, twist, dart like furious hornets. And they can whisk a landing force to a beach in a breath-taking hurry!

Motors for the Storm Boats . . . motors jam-packed with power and stamina . . . the assignment to build them was given to Evinrude. Years of experience building great racing Evinrudes, mightiest of outboards, gave quick answer to every requirement of speed and ruggedness and "fighting heart". Down the production lines they came . . . dynamic "storms" of eager power to drive the fleets of Storm Boats!

Giving top speed to assault craft . . . driving heavily laden barges and lighters . . . capably powering small boats of every type . . . Evinrude motors are serving on many fronts! Building for Victory is our sole job now . . . with peace, there will be brilliant new Evinrudes for happy days on the water again.

**EVINRUDE MOTORS, Milwaukee, Wisconsin**

Evinrude Motors of Canada, Peterboro, Canada

★ HELP SPEED VICTORY . . . BUY MORE BONDS

# Miss Priority

[*Continued from page 95*]

and mark it along the chine and along the deck stringers. This will give you your cutting line. The edge may be planed off after the plank is fastened in place. Fastenings for planking may be screws or nails whatever you can secure.

When the planking is complete and not before, the boat may be turned over and the deck beams fitted in place. After they are in and fastened, the excess amount of the frames may be sawn off and the cross braces removed. Do not remove these however, until you are sure that the deck beams will hold the hull in shape. The deck beams are sawn to various crowns. The way to do this is to note on the dimensioned drawing the height of crown over the base line and also the beam of the boat. Lay off these three points and strike an arc with a pencil and string so that it passes through all three points. Each will be different as Miss Priority has a high crowned deck to give her a racy appearance. Saw your deck beams to paper templates you make of each crown. There is one beam on each frame. If you want more you can fit them when the original beams are in the boat.

The deck is usually bradded to the beams, each brad being driven into the wood with a counter-sink and the head filled over with putty so it won't come up and punch a hole in your muslin deck covering. Don't make the deck boards too wide as their edges are more apt to curl up if you do this and will cut the canvas.

Before you put on the deck, be sure to include a fore and aft piece under the deck where the mast passes through. This should be about 6" wide by 1" deep and fastened from the first frame to the bow transom. There should also be a block placed on the keel with a square hole cut in it to take the tenon on the foot of the mast. This block may be the width of the keel by one inch thick. Do your best to get it so that the mast has the proper rake. You can figure this out in a simple pencil sketch.

The mast and boom are quite simple to build. You use two pieces for each, routing them out before joining together—one for the hollow part and the other for the slot. The drawings show this clearly. The mast being rectangular when ready for glueing. The mast should be hollow only for the length of the slot as it would weaken it to hollow it out below the boom or above the slot. Get the best waterproof glue that you can find for the job and follow directions closely as it is tricky stuff to use. After the glue has thoroughly set, the mast may be planed and shaped to its streamlined form. The same, of course, applies to the boom.

The rudder and tiller drawings are practically self-explanatory. The trick here is, of course, to get the metal and rivet materials specified. Shop around at various automobile junk yards for both or use old curtain rods for the rivets. It is quite possible to get the materials if you look long enough or perhaps you can find some material kicking around your shop.

When the centerboard is hung in the slot, hold it in its "all the way up" position and drill a hole above the water line clear through the sides of the trunk and the centerboard. Then lower the board a few inches and go through the same holes in the sides but drilling a new one in the board. Do this every six or eight inches until the board is down to about 45 degrees from the keel. You can arrange a pin on a lanyard on one side of the trunk which may be inserted in the slot to hold the board in any desired position.

The entire hull should be sanded smooth and painted to suit. The cockpit shown is 2' wide by 6' long and is only supposed to be a place where you can put your feet. Miss Priority is distinctly a "sit-on-the-deck" boat and is meant for sailing or racing. Her sailing balance has been carefully worked out and if you place the mast and centerboard as shown she will sail like a real little yacht. Changes in the rig or other vital requirements are to be discouraged but so far as materials are concerned you can experiment all you wish.


## FOR THE DURATION

**If your copy of *Mechanix Illustrated* fails to arrive at your newsstand on time, please be patient. Remember that the nation's transportation system is all-out for war, and that distribution of *Mechanix Illustrated* to your area may often be delayed for several days to make way for movements of fighting men and their supplies.**

**But remember, too that paper rationing has forced a reduction in the number of copies of *Mechanix Illustrated* that can be printed. ASSURE YOURSELF OF GETTING YOUR MECHANIX ILLUSTRATED in these days, when it is bringing you more important news than ever before, BY RESERVING YOUR COPY AT YOUR NEWSDEALER'S EVERY MONTH IN ADVANCE.**


*Build with blueprints.* MECHANIX ILLUSTRATED conducts a blueprint service for the convenience of its readers. You will find a partial list of available plans on page 158.

# Would you turn your back on a wounded Soldier?

*You think you wouldn't...you don't mean to...*

But unless you are giving every precious minute of your time . . . every ounce of strength that you can spare . . . towards helping win this war as a civilian, you are letting down those soldiers who are sacrificing lives to win it for you.

What you are asked to give up isn't much compared with what they're giving up. The extra work you undertake is small compared with the gigantic effort they are making. But to a wounded soldier, what you do can mean the difference between life and death.

*You* make the choice.

LOOK AROUND YOU! *Pick your war activity—and get into it! In your local Citizens Service Corps or Defense Council there is something for every man, woman and child to do. If no such groups exist in your community, help to organize them. Write to this magazine for free booklet, "You and the War," telling what you can do to help defeat the Axis. Find your job—and give it all you've got!*

Contributed by the Magazine Publishers of America

**EVERY CIVILIAN A FIGHTER**

"I'm sorry, Mr. Jackson, but that sign doesn't include your wife!"

## Grumman Avenger

[*Continued from page* 118]

or draw knife. Continue carving, scraping, and sanding until the cardboard templates fit perfectly.

Carve out the inside of the fuselage, insert the center instrument panel, along with seats made from a tin can. Insert exhaust made of a soda straw. The rear gun turret is made from a small, seam-free light globe. The socket end is filed off with a rat tail file and turpentine. The rear gunner, carved from balsa, is inserted into the bottom of the light globe. Instrument panels are drawn with a fine pen on paper and glued in position. The light globe is held in place by short seats or saddles of celluloid on the sides of the globe as well as the extended top canopy. The main canopy is bent to the required curved shape by heating the inside of the bend. It will curve over to the proper shape. Install the lower rear gunner's window panel.

Cut the wings in two halves, shape, and sand smooth. Attach to the body with the aid of two matches. These are inserted in the fuselage. Slide the wing on these strengthening dowels. Cut and sand the tail surfaces to shape. Attach with match stick dowels.

Make the landing gear of baling wire (flat) with adhesive tape shock absorbers, and tin can fairing strips. Wheels can be turned, hand carved, or purchased. Attach the tail wheel. Carve propeller blades, and insert into a balsa hub.

Fill the complete surface of the ship with Babco floorwood filler, or flour and water paste. Sand and apply camouflage paint in five coats, sanding between each one.

Finally, attach the radio aerial of horsehair wire, and scribe in the control surfaces. The camouflage paint should be very dull.

## Plastic Photo-Gadgets

[*Continued from page* 89]

ness, and produce the most beautiful results of all. This is the type of material that breaks with a glistening fracture surface, takes a gem-like polish, and is the same color (or colors) all the way through—coming in all colors of the rainbow, clear or translucent. It is found in some knife handles, drawer pulls, and juke box cabinets, and can be distinguished by its characteristic formaldehyde odor when heated up by a dull tool. It is non-inflammable, non-absorbing, and inert to chemicals—coming in molded shapes, rods, sheets, and cylinders. It can be worked with any wood or metal-working tools, except the knife-edge type and can be turned, drilled, filed, sanded, and polished like glass with little trouble. Seldomly available from hobby-supply houses, as in peace time, this type of material should be saved when found in any scrap form, for future work. The cast phenolic type of material is mildly responsive to heat, as it can be bent once or twice through an angle of about 30 degrees before it sets for good. This is accomplished by heating the material in hot water at about 170° F. for a few minutes, bending it and then letting it cool under clamps.

Many photo-gadgets can be made of the cast phenolics: synchronizer brackets, lens-boards, switch-panels, lens-caps, filter-holders and lens-shades, easel and printer-parts, etc. Lens-boards are probably the commonest need, and you can make a set so that all your lenses can be used interchangeably on the enlarger or on various cameras. For this, $\frac{1}{8}$-inch or heavier sheet material is required, cut to size with the hacksaw. Cut out the lens-hole with a fret-saw, with a connecting series of drilled holes, or with an electric hand-grinder. Don't worry about the threads—if you haven't an extra flange which can be screwed down, just cut the hole in the plastic sheet the smallest bit under-size; then screw the lens in. It will cut its own threads as it goes, which will make the unit strong enough.

As for practical working tools, electric hand grinders are excellent for the heavier materials; also, any of the light power tools—wood or metal lathe, power saws of all types, sanding discs, and buffing wheels. Shaping of heavy materials can be done with hacksaw and ordinary files. With sheet acetate, a pocket-knife will serve for practically all purposes.

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Grand Coulee dam will eventually provide water for irrigation of 1,200,000 acres of productive land.

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Every dollar spent for the war effort requires 2¾ kilowatt-hours of electric power.

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Plastic water faucets have been adopted by the Army to replace critical brass.

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The bridge, or flight deck, of the Navy's flying battleship Martin Mars is larger than the entire interior of a 21-passenger plane.

# WHEN A FELLOW NEEDS A BINOCULAR...

*"Hold it, boys! Those devils are up to something"...* Naked eyes might never have seen the danger. A whole detachment might have walked into death. Thank heaven, ONE pair of eyes in this group was NOT naked!

Wars have always been full of tricks and surprises, but your boy today is facing the trickiest and most ingenious enemies in history. Countless times, he may owe his life to the fact that his binoculars are constantly on the watch.

Universal is proud to be one of a few manufacturers now making binoculars for our Army, Navy and Marines and The United Nations.

This work has led Universal to pioneer in many ingenious new methods of production—significant and permanent contributions to America's future leadership in the manufacture of precision optical instruments.

**A PATCH OF FOAM** in the distance could be a torpedo, a U-boat surfacing... OR Americans adrift in a lifeboat. The men in the new DE boats must know, use binoculars to be sure.

**BEFORE HE LAYS THAT WIRE!** A man at work is an easy target for a hidden enemy. This U. S. Army Signal Corps man is trained to survey the terrain carefully with binoculars.

*There's only one flag we're prouder of!*

REMEMBER YOUR PLEDGE TO BUY WAR BONDS, AND LIVE UP TO IT!

# UNIVERSAL CAMERA CORPORATION

NEW YORK • CHICAGO • HOLLYWOOD

Makers of Precision Photographic and Optical Instruments

PEACETIME MANUFACTURERS OF CINÉMASTER, MERCURY, CORSAIR CAMERAS

"I'm sorry, Mr. Jackson, but that sign doesn't include your wife!"

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[*Continued from page* 118]

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[*Continued from page* 89]

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**PEACETIME MANUFACTURERS OF CINÉMASTER, MERCURY, CORSAIR CAMERAS**

# 18th Century Breakfront

[*Continued from page* 103]

breakfront a minimum width of 10¼" at the upper outside sections, and a maximum width of 14" at the bottom outside sections will be found. These dimensions together with those given in the diagrams should be noted, and referred to in the selection of the material, if any choice in width or length of lumber is available. If the lumber is purchased in the rough and is 1" full, ask to have it dressed to ⅞". The company from which it is bought will be glad to do this as the price per foot is usually given for dressed stock. In the event the material is already dressed to ¾", extreme care must be taken with the surfaces in keeping them from being dented or marked deeply. For this reason a ⅞" stock is preferable since it can be planned and scraped to the required size as the work progresses.

The first step to be taken when the lumber has been delivered is to select the best pieces for the exposed sides of the breakfront. These and the remaining pieces should be marked with a soft crayon according to the positions they are to occupy in the piece of furniture. In cutting the parts from the lumber, make all lengths an inch or two longer and the widths an eighth or quarter inch wider than required. Then, as each part is worked on, it can be finished to the required dimensions with more accuracy. Also, should any dent or deep marks occur they can be eliminated in the dressing operation. All pieces should be placed flat or upright on ends and if possible be kept in clamps or under suitable weights until they are ready to be placed or assembled in sections. This will prevent any possible warping which is likely to take place in solid woods.

Next set aside enough material to make seventy linear feet of ¾"x2" framing for the grilled and panelled doors, and seventy linear feet of ½"x¾" material for the muntins of the doors. If the making of the molded frames and muntins are not within the reach of the worker, this lumber, with a detail of the frame and muntins, should be taken to a nearby molding company. They will be glad to do the work and will charge a reasonable sum.

All trimming parts, including moldings, cornice members, ledger member, and base have been given in linear feet. Exact dimensions would not be practical since actual measurements must be taken on the completed piece to insure proper fitting of all mitre cuts. A liberal allowance for waste has been allowed in the required footage for each member.

### PARTS LIST FOR BOTTOM SECTION:

Outer sides (AB and GH)—2 pieces—¾"x12½"x35⅝"
Bottom—1 piece—¾"x13⅜"x64"
Top—1 piece—¾"x13⅜"x65"
Inner sides (CD and EF)—2 pieces—¾"x13⅜"x35⅝"
Ground—1 piece—1⅛"x3¾"x31½"
2 pieces—1⅛"x3¾"x15¼"
4 pieces—1⅛"x3¾"x11"
Side shelves—2 pieces—¾"x11⅜"x15¾"
Drawer slide frames—3 pieces—¾"x13⅜"x32"
2 pieces—¾"x12⅛"x15¾"
Panels for frames—1 piece veneer—2'6"x2'6"x¼"
Base—1 piece—¾"x4¼"x10'0"
Back (veneer)—1 piece—¼"x31⅞"x64¼"
Drawer fronts—4 pieces—¾"x7"x31½"
2 pieces—¾"x7"x15¼"
Sides of drawers—6 pieces—½"x7"x12½"
4 pieces—½"x7"x11"
Backs of drawers—3 pieces—½"x7"x31½"
2 pieces—½"x7"x14½"
Drawer bottoms (veneer)—2 pieces—2'6"x2'6"x¼"

### WRITING COMPARTMENT:

Sides—2 pieces—¾"x6½"x12½"
Back—1 piece—½"x6½"x31½"
Bottom—1 piece—½"x12½"x31½"
Runners—2 pieces—¼"x2¼"x12½"
Rack—1 piece—⅛"x12"x4'0"
Door panel—2 pieces—¾"x14½"x22½"
Molding for drawers—1 piece—¾"x¾"x40'0"
Astragal molding—1 piece—⅜"x¼"x10'0"
Saddle for upper doors—1 piece—½"x1½"x10'0"
Ledger board—1 piece—¾"x3⅜"x10'0"
Cove molding—1 piece—½"x½"x10'0"

### PARTS LIST FOR TOP SECTION:

Outer sides (IJ and OP)—2 pieces—¾"x10¼"x41⅜"
Top and bottom—2 pieces—¾"x11⅜"x63"
Inner sides (KL and MN)—2 pieces—¾"x11⅜"x41⅜"
Frieze (Left and right)—2 pieces—¾"x3¼"x15¾"
Frieze (Center)—1 piece—¾"x3¼"x31½"
Shelves—4 pieces—¾"x9⅞"x15½"
2 pieces—¾"x11⅜"x30½"
Back (veneer)—1 piece—¼"x41"x62¼"
Cornice (see detail)—10' for each member

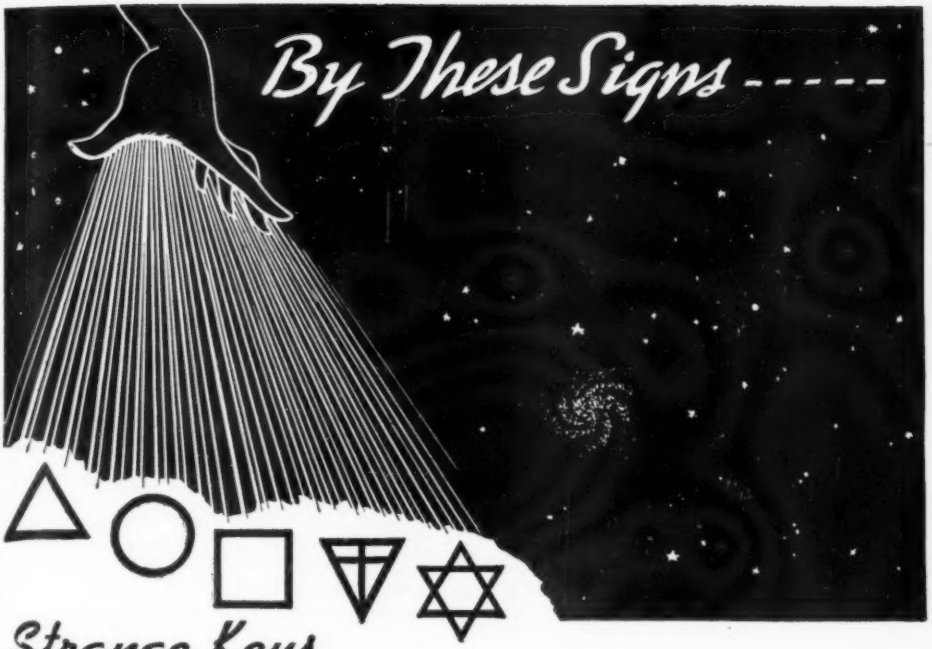
### HARDWARE:

4 drawer locks—mortise type with escutcheon hole 1½" from top
5 door locks 1¾" wide with long key to go through ¾" thickness of doors and into lock which is screwed on back of door stile
1 pair of brass hinges—medium—for desk compartment drop front
6 pairs invisible hinges—brass
1 pair brass brackets—8"—for drop front supports
2 2" brass stop bolts for left door of center section
1 1½" brass thumb control side-front catch (locking drop front to side)
10 drawer pulls—brass or antique bronze—colonial design
4 escutcheons—brass or antique bronze—horizontal
6 escutcheons—brass or antique bronze—vertical
2 door pulls—pendant type—brass or antique bronze
Putty—2½ lbs. for lights in grill work
Brads—½" and fine. Small heads to be cut off. These are to go through tongue of muntin to hold glass panes before the putty is applied.
Glass—30 square feet—single thickness
Stain—oil. This depends on the wood used and color desired: mahogany, walnut, maple.
Shellac—pure white 100%. Mix half and half with alcohol.
Steel wool—rub down shellac with No. 00 after each coat. Two times is sufficient.
Caruba wax—1 lb. Add pure paraffin and turpentine. Apply with brush and rub down to a fine finish.

# Shop Shortcuts

[*Continued from page* 112]

To use the template, place it over the edge of a board and slide it along until the dowel-rod stop strikes the board end. Bore the holes, using those in the template as a guide for the bit. Turn the template over and use the opposite trough for positioning it over the edge of the second board. The template can be "stepped" along the edge of a long board, the dowel stop being inserted into a hole already bored.




# Strange Keys to the Powers of the Universe

"GOD GEOMETRIZES," said an ancient sage. Within the straight line, curve, and angle—and their combinations—exist the forces of creation. These *secret symbols* contain the mysterious laws of the universe. Upon their right use—or the neglect of them—the success or failure of every *human enterprise* depends.

Have you a desire, *something you wish to accomplish* in life? Put your finger on a dot. In whatever direction you move your finger from the dot, you have made a beginning. Thus a dot is the symbol of *one*—or a beginning. Your desire then is also symbolized by *one*. If you follow the *proper method* or way to accomplish what you want, you have arrived at point *two*. Whenever these two symbols are brought together—the idea and the right way—you produce point *three*—the success of your plan. Success, therefore, is symbolized by the three equal sides of a *triangle*.

In planning your personal affairs—business, domestic, or the welfare of your family—do you use a *Cosmic formula?* Do you determine whether your acts are in accord with Divine truths eternally expressed in symbols? Why does the circle represent completion? Why is it said that a man is on the square? These symbols are used by astronomers and scientists to prove the physical laws of the universe—why don't you apply them to the problems of your everyday world? Learn what symbols, as powers and forces of nature, you can simply and intelligently use in directing the course of your life.

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## Modern Cigarette Boxes

[*Continued from page 97*]

tape and allow twenty-four hours for setting.

The finger grip for the top is detailed in (5). The four sides of the oblong are beveled in at an angle of thirty degrees. The material may be glass, clear plastic or cut from the same wood as the ends.

Since the beauty of the box depends to a large extent on the perfect fitting of the parts, it might be wise to fit the top after the box has been assembled. There should be a clearance of 1/64" on all four sides.

**The round box** has the sleek appearance of professional marquetry work and yet is so simple in construction as to be well within the scope of the average home craftsman.

The effect depends on contrasting woods. Walnut and maple were used in the box shown in the photograph; however, a contrast of any light and dark woods should prove equally effective.

Cut a strip of walnut to the dimensions, 1¼" x 1" x 20" and a strip of maple, ¼" x 1" x 20" and glue together as shown in (1). After the glue has set, plane and sandpaper to a satin finish. Cut four sections, each 4½" long from the glued piece and arrange in the pattern shown in (2). If all the ends are true and square you should have a block whose outside dimensions are 5¾" x 5¾", with a square hole in the center measuring 3¼" x 3¼".

Find the center of the block and with a pair of dividers scribe a circle of 5½" diameter. Trim off the excess wood with a band or scroll saw and true up the circumference on a lathe.

From a strip of wood ⅛" x 1" cut four pieces 3⅛" long and fit into square hole so as to form a ⅛" rabbet for top and bottom, (5).

The bottom consists of a piece of wood or masonite ⅛" thick by 3¼" x 3¼", glued into place.

The top is of double thick glass cut to the dimension $3\frac{3}{16}$" square, edges seamed and a glass ball one inch in diameter cemented in the center. These balls may be purchased at the five and dime and come in an assortment of fascinating colors. Plastic or wood may be used in place of glass, if desired.

*Please turn to the Editor's Workbench department for a thumbnail sketch of Paul Lobel, versatile and talented designer of these cigarette boxes.*

## Ideas For Service Men

[*Continued from page 123*]

rinse water over a table top, Pvt. Townley takes a sugar sack, or other wide rag and lays it down flat across one end of the table. Then, with a mighty swish he pulls the rag the length of the table, removing excess water in a hurry and leaving the surface bone dry. All right, so it'll still be a little damp, but think of the time saved. If you doubt this, just try it next time you get K.P.

## Darracq Touring Car Of 1904

[*Continued from page 116*]

resemble slip covers. Front seats are identical right and left, also handcarved from soft pine, as in Fig. 8.

Under the floor of the hood glue semi-cylindrical pieces to represent crankcase and flywheel housing, as in Fig. 9. The hood itself is a solid block, with radiator of evenly spaced punch marks, or fine screen. Louvres are simply grooves, the dash ⅛-in. material upon which are mounted blocks for the acetylene generator and the coil box, Fig. 10. A small wood disk serves as distributor and crank is made of brass. In Fig. 11 are shown construction of running-board brackets, springs and spring shackles and gooseneck. Main leaves of springs are steel, with balsa or pasteboard auxiliary leaves. The rear axle is similar to that of some of the preceding models, except that the drive is by shaft in a torque tube (one piece) instead of chain, Fig. 12. The front axle may be whittled from hardwood with wire steering arms, link and tie-rod, Fig. 13, or the entire unit may be made of metal if you have the equipment. An underneath view of the bare chassis frame gives location of muffler, Fig. 14, the latter being merely a wooden cylinder with heavy wire or tubing exhaust pipe.

Wheels are made as in preceding models, a wood blank being turned on lathe faceplate to form rim and hub, and drilled and wood spokes inserted before removing from faceplate. Rear wheels have wood disks for the brake drums Fig. 15.

This car should be painted maroon and, if you have the skill, fine gold striping. Tires should be a very light gray and lamps bronzed, with such metal work as there is highly polished. Upholster in a tan to represent slip covers.

"You said you wanted it to purr like a kitten, didn't you?"

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## Popular Patents

### *Car That Lifts Itself*

A pessimist was once defined as a driver who always keeps a towrope attached to his front axle. Of the same genus, one might think, is the invention for motor vehicle patented (No. 2,310,942) by Conrad Donges of Secaucus, N. J. He provides his car with a rear axle having two downward-pointed, bevel-geared power takeoffs, either of which is keyed to engage the top of an ordinary screw lifting jack. The car is thus able to lift itself when it becomes necessary to change a tire.

### *Grenade-Throwing Bag*

Patent 2,311,160 was issued to R. A. Dobbelaar of Plainfield, N. J., on the idea of a grenade-throwing bag. It is really an adaptation of the stone-and-sling with which David knocked out Goliath. The grenade is placed in a little bag with a drawstring, in the loop of which is a large wooden or plastic bead which rolls off the thrower's fingers, making it easy for the soldier to let go. The centrifugal effect of the overhand swing is claimed to give the throw greater range.

The long wooden stick of the German "potato-masher" grenade presumably gives the same effect, but it is stiffer to handle, awkward to carry, and interferes with the accuracy of the missile's flight.

For assisting in the application of finger nail polish, Norma Stedman of New York City has provided a stencil having an opening to register with at least a portion of the nail of a finger. The stencil is in the form of an elastic cap. Cover parts may be used to provide a half-moon or the sides or tip of the nail from being coated with polish. (No. 2,283,703.)

## "Heightometer"

[*Continued from page* 111]

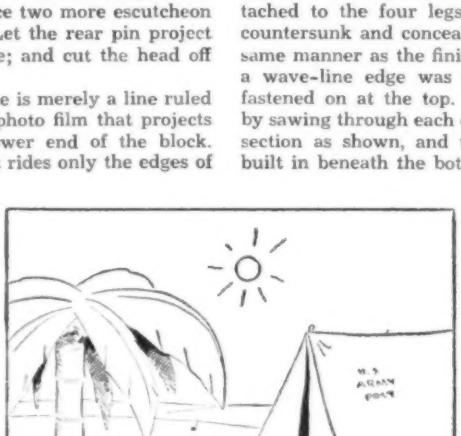
brass escutcheon pins with their points cut off and the remaining ends filed smooth. Each pair of pins must be in alignment so the block will slide smoothly. Cut the grooves in the bar with a circular saw, if possible.

In the side of the block, preferably the left side because most people will use their right hand to operate the device, place two more escutcheon pins to serve as sights. Let the rear pin project farther than the front one; and cut the head off the front pin.

The pointer or index line is merely a line ruled on a strip of washed-off photo film that projects about ½ in. from the lower end of the block. The block is recessed so it rides only the edges of the bar face, to prevent wear on the scale; and this recess provides space for tacking or cementing the celluloid in position.

The scale on the front of the bar can be either a piece cut from a cloth or metal measuring tape, or a section of yardstick. That shown was drawn on paper with black India ink. If the scale is paper or cloth, simply glue it to the face of the bar, leaving about ⅛ in. at the edges. If it is made of thin steel, use small brads or screws. If a section of yardstick is used, it can be fastened to the surface and the block cut away enough to clear it.

After the scale is in position, you are ready to calibrate the heightometer. This consists merely of fastening it to the wall at the proper height. First, measure your own height carefully with a yardstick or tape. Set the pointer or index line on the block at your measured height on the scale. Hold the bar vertically against the wall and, without shifting the pointer, move the assembly up or down until the two sighting pins are aligned perfectly while you look straight ahead at them. Don't tilt your head up or down, but hold it in a normal position. Mark the position of the screw holes, and fasten the bar securely to the wall. Assuming that the distance between the eyes and top of the head is about the same for all people, the device will measure other people's heights with fair accuracy—provided they look straight ahead in a normal manner. It is best to stand about arm's length when adjusting the block.



"Can't you get anything but hot music?"

## New Furniture From Old

[*Continued from page* 130]

The nails were countersunk and the depressions filled with crack filler sanded smooth when dry. Thus when painted over, the nail heads were invisible.

The top was cut down and the front edge and both ends were cut to concave curves as shown. This curved-edged piece was used as shelf attached to the four legs by screws which were countersunk and concealed by crack filler in the same manner as the finishing nails. A piece with a wave-line edge was cut from ½" stock and fastened on at the top. The legs were removed by sawing through each one just above the square section as shown, and two small drawers were built in beneath the bottom shelf.

After these changes had been completed the piece was painted with a flat white undercoat followed by a coat of honey-colored glossy enamel, while the drawer fronts were painted dark amber.

For the mirror-topped table, the mirror itself was obtained from an old dresser which had long since found its way to the kindling pile. The first step in making the table was to remove the mirror from its frame, taking care not to scratch the quicksilver backing. Then the mirror was wrapped in paper and put aside until final assembly. Next a new back was made and sanded to fit.

The table used had curved legs cut from flat stock, and one leg had a piece broken off at the lower end. This offered no difficulty, however, since that portion of the leg was not used. The four legs of the finished table are identical and were crossed with a lap-joint, and the upper and lower ends reversed. Holes were drilled in the crossed legs and the rung was glued in place. The upper ends of the legs were joined by pieces cut as shown. These pieces were lap-jointed to the legs and dowelled to a central piece running lengthwise under the table top.

All dowelling was glued and the lap-joints glued under pressure. When dry, the understructure was centered on the table top and screwed in place. When assembled, the table was given a coat of flat white paint and then a coat of hard-drying, glossy enamel.

## Half Helicopter, Half Airplane

[*Continued from page* 41]

to the corner grocery, a block or two from home, you'll merely lock your *rotor-wing* in a fore and after position and drive your ship like an automobile. With the *rotor-wing* in the same position your Convertaplane will fit in an average size garage.

But private operation will not be the only use to which these all-purpose machines will be put when peacetime production makes them available to the man in the street. Consideration is already being given to specifications for tomorrow's super-ambulance—a specially built Convertaplane that can land anywhere and take off vertically on either land or water, and convert in mid-air to an airplane capable of 300 mile-an-hour speed. Like the smaller private ships of its type, it will be able to lock its rotor fore and aft when its mission calls for ground travel—even on the narrowest winding streets of a crowded city.

Like the ordinary helicopter, your Convertaplane will hover in mid-air, when you want it to, supported by its rotating *rotor-wing*. It will climb straight up or settle slowly straight down, or travel in any desired direction. But as the present-day Convertaplane has already proven, it will also do what no other aircraft ever built can do—it will convert from one type of aircraft to another in mid-air. After lifting itself and its load vertically from the depths of a canyon-like city street to a point well above the pinnacle of the highest skyscraper, it will respond to a mere movement of your fingertip like a genie of old—and become one of the fastest airplanes in the sky.

You'll fly as fast as a pursuit ship in your Convertaplane, but you'll land at less speed than the slowest glider—or at no forward speed whatever, for you can land straight down as slowly as you like. Whether your business carries you from house to house, or from coast to coast, the Convertaplane, newest of aircraft types, can provide your transportation.

Thanks to the Convertaplane, the post-war argument that might have developed between you and your spouse need never occur. Mrs. Jones might have demanded a helicopter—so she could use it for shopping and getting over to Jessica's house for bridge or gin rummy. Mr. Jones would probably have held out for something in the line of a trim, fast monoplane—so he could take those week-end fishing trips in the Yukon. Now both can be satisfied. You can snatch your wife from a Manhattan tea, deposit her in the Convertaplane cabin amid fishing tackle and camp kits, and whisk her away—from the roof of the apartment building for a two-hour hop to a spot landing in the wilds of the North woods.

---

Alaska's coastline totals about 26,000 miles.

---

The high proportion of fat in pork keeps the lean meat from hardening during the curing process.

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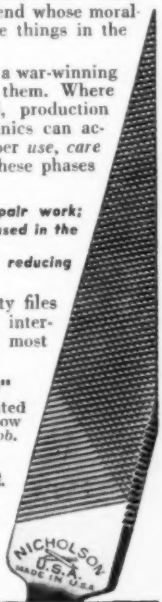


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## Backyard Ranger Course

[*Continued from page* 106]

ladders (Fig. 8). The participants climb up one side, down the other—first on one ladder, then on the other. After the ladder work, they must run around the obstacle and slide under the rope square in the center (at the bottom).

A path from this point leads to the final stage of the training game, the rope swing. The contestant must swing clear over the soft earth hollow while holding to the rope with his hands. The first one to accomplish all these training feats is the winner. (See Fig. 9.)

Another training unit that is ideal for use in promoting teamwork among the youngsters, is the wooden airplane. Any available set of wheels of the type indicated, should suffice for this one. The participants form two teams, each with its own "airplane." At a given signal, the two teams start to rush their planes into "concealment"—as in the event of a bombing raid on an airport. The first ship to reach the shelter area is the winner. Shelter areas can be marked off at varying distances from the start, increasing the distance as the contestants gain in proficiency.

## Set Servicer

[*Continued from page* 117]

lighted magnifier will have appeal. To any good magnifying glass of less than 2" in diameter add a long handle in any convenient manner that can be bent up at nearly right angles. This should preferably be of metal so a radio pilot lamp socket can be soldered to it. Remove the reflector from an old flashlight and catch it to the socket with a drop or two of solder in the position indicated.

Wire a light, flexible electric cord to the socket terminals, twist them about the handle and terminate in a pair of clips.

The power source can be a 2½ or 6.2 volt radio filament transformer, or a storage battery can be substituted for the latter when no commercial power exists. These low voltages will also provide a safety factor for the user.

When working properly the light beam should be cast over an area below and in the field of the glass and thus the user can see exactly what he desires at a minimum of discomfort.

## Pre-Amplifying Receiver

[*Continued from page* 117]

make metallic contact along the entire length of this path. Shunt the entire coil with a 50 mmfd. (.000050) fixed condenser. Ground the slider connection end and arrange the other end so it can be connected to the antenna and the antenna post of the receiver.

By changing the slider contact setting on the coil to suit the frequency and conditions, points will be found where weak signals can be built up much stronger and practically inaudible stations heard clearly.

## The School Shop

[*Continued from page* 110]

*Traffic Control Centers*, situated at the principal airports and handled by Federal employees, the "air-traffic cops." At the Center, a record is kept of all aircraft movements in that Area. Outside these Areas, flight is governed by the general rules of the Civil Air Regulations. Recently the C.A.A. has expanded its facilities so that at the present time practically all Civil Airways are Control Areas, however.

The larger airports along the Civil Airways are called *Control Airports* and it is their function to direct air traffic in their immediate vicinity by radio, flag and light signals from the *Control Tower*. *Control Tower Operators* are not necessarily Federal employees but they must hold C.A.A. licenses qualifying them for their jobs. They are the special "air-traffic cops." An area with a radius of three miles from the Control Airport is the *Control Zone* within which the Tower Operator manages his traffic. Situated in this Control Zone is the Radio Range station previously mentioned.

Where Civil Airways intersect, the Control Airport takes on added duties. The Tower must handle all the traffic from the converging airways. An area with a radius of twenty-five miles from the Control Airport and Radio Range Station at such an intersection is called a *Control Zone of Intersection*, and the Tower is responsible for its traffic.

In locating Civil Airways, the C.A.A. must avoid trespassing on certain sections of the country designated by the President of the United States. These sections are known by the name *Airspace Reservations* and they are prohibited flying areas. Only planes with special permission and on special duty may fly over them. Washington, D. C., is the foremost example of these. Our President's home at Hyde Park is another. There are other sections named *Danger Areas* over which flying is not prohibited but is restricted. We'll hear more of these later.

There we have our airway traffic system which guides the transient pilot safely to his destination. There are numerous other safety devices on the airways which help the pilot. Rotating beacons at intervals of 15 miles, intermediate landing fields at 50-mile intervals, course markers, Sectional and Regional Aeronautical Maps, etc., help him to keep on course. They belong to the study of Navigation and we'll study them in detail in a future lesson.

In view of the fact that Civil Air Regulations will occupy our attention for the next few lessons, it will be to your advantage to obtain a copy of the DIGEST OF CIVIL AIR REGULATIONS, Civil Aeronautics Bulletin No. 22, which you can get by sending 20 cents to the Superintendent of Documents, Government Printing Office, Washington, D. C.

*(July MECHANIX ILLUSTRATED will contain Lesson 6: Air Traffic Rules. In it will be continued the discussion of safety in modern flying. Don't fail to get your copy. Questions on this lesson will be found on page 152.)*

## Mechanix Of Gypsy Rose Lee

[*Continued from page 50*]

consists of three walls made in three or more sections, which pin-hinge together and fasten securely to threaded plates in the stage floor. Chalk-marks on the floor indicate where tables and chairs should be placed, and the scene changes are made with a minimum of waste motion.

An average of 25 to 30 stagehands are needed to handle this intricate job, and each has his particular task all mapped out for him. As soon as the curtain drops, he rushes in with his companions and literally tears down the set while others build a new one in its place. Busy as ants, they rush back and forth carrying props and sets, criss-crossing each other's paths, yet never colliding with each other, so efficiently do they function! Props and sets are stacked in every available space, yet no piece is ever mislaid or placed where it will be hard to get at.

In a musical such as Star and Garter, as many as 200 spot and floodlights may be used, burning as much as 1,000 amps. in all! To safeguard against an important light burning out at a crucial moment, each one is covered by a double to take its place in the event of trouble. Thousands of feet of wire run from the switch boards to these lights and 7 or 8 electricians who man the switches work on a planned schedule, receiving their cues from the stage manager, who signals either through a talk-o-phone or by flashing lights.

In designing the sets, the set designer has to consider the weight each piece is to support, the lighting effects, which he works out with the head electrician, and scene changes. Howard Bay, well known set designer who designed Something for the Boys; Uncle Harry, which utilizes a jack-knife change; The Eva of St. Mark which has a turntable change; The Patriots; and is currently working on Secret Weapon, develops many of the ingenious sets and props seen in Broadway productions. His bouncing airplane cabin in Something for the Boys is an amazing piece of mechanical genius as are many of his other developments.

After working out his ideas in sketches, he builds miniature working models out of cardboard, and from these, the full size sets are built. Much of the ingenuity of backstage mechanics can be credited to the set designer.

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During the first three years of World War II, American aircraft industries produced $5.250,000,000 worth of warplanes, engines and propellers, as compared with one-eighth that amount in the previous ten years.

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Fire prevention experts list three classes of fires: fires in ordinary combustibles such as straw, clothing, rubbish; fires in highly combustible materials such as gasoline, kerosene, oils; fires in or around electrical equipment on which there is a dangerous voltage.


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# Modern Houses Of Earth

[*Continued from page* 126]

If notched bricks are not made, the window and door frames can be attached to the ordinary bricks by clamps embedded in the mortar joints.

For mixing the soil material for bricks, a plaster mixer operated by a gasoline motor may be used, or the soil may be mixed in a mortar box with a spade or hoe. A plaster mixer is easier and faster and makes stronger bricks because it mixes the material thoroughly. A concrete mixer may be used if all clods are removed from the soil by screening. Plaster and concrete mixers may be rented for a nominal weekly charge. The production of bricks may be tripled by using a motor-powered mixer properly.

Fill the one cubic foot form, which you used for making the rammed earth test, with soil and count the full shovels necessary. The same amount of soil should be shoveled into the mixer or mortar box. This will make two standard size adobe bricks. Start the mixer and after shoveling in enough soil for one brick, put in the same amount of water that was used in the adobe brick test. Then shovel in soil enough for another brick, and add sufficient water. Do this until the power mixer is almost filled. Next put in enough asphaltic emulsion to stabilize the amount of soil in the mixer. Observe the color of the mixture, and when its color is uniform and all clods are broken, it is fully mixed. Dump it into a wheelbarrow and carry it to the forms.

You may find it more convenient to put first into the mixer about four-fifths of the water, then all of the asphaltic emulsion. Then after shoveling in the soil, add water until the right consistency is obtained. The mixer should be turning as the soil is added.

A simple way to test the mixture for proper consistency is to throw a handful of it against a vertical surface. If It rolls away, it is too dry; if it does not stick and retain its shape, it is too wet. The forms should be ready for molding, resting on either newspaper, building paper, burlap, sand or wood lath pallettes on smooth ground. Put on rubber gloves and ram the mud into corners of the form with your hands and press into shape. Scrape off the surplus material by drawing the edge of a board over the top of the form or use a large trowel. A sprinkle of water on the top of the brick, spread evenly with your hands or trowel, will seal the top of the brick and help to prevent cracking when drying. Now withdraw the form. If the brick was properly compressed and neither too dry nor too wet and the form was well made, the brick will be perfectly shaped.

To speed production, only enough material to fill the forms should be dumped into them from the wheelbarrow. Most plaster mixers have enough power to handle from 1½ to 3 cubic feet of material, enough for three to six bricks. The material should be well mixed in two or three minutes. Since all mixers are not alike, you will have to experiment to learn the capacity of yours.

By using an efficient method, two workers can mold at least one hundred and fifty bricks in one day by hand mixing. The brick making can be more than doubled by using a power mixer. Of course, after about the second day of molding, more working hours will be required to mold the same number of bricks per day, because time must be allowed to stand the previously molded and dried bricks on edge.

For hand mixing in a mortar box, follow the same procedure as mixing with motor power. First, throw in soil enough for one brick, then mix with the right amount of water. Then add soil for another brick and the water. After enough soil for ten or twelve bricks is thoroughly mixed with water, put in the correct amount of asphaltic emulsion and mix until the color of the material is uniform. Dump the mixture into the forms and mold the bricks. In hand mixing there is a tendency to use too much water because of the arduous work. The mixture should be only wet enough to be readily workable in the forms. If the bricks do not slide out of the form easily, old material has stuck in the form corners or the soil material is too dry. If the brick does not hold its shape after casting, it is too wet. Too much water makes a brick more apt to crack when drying under a hot sun. When the weather is very hot, it is wise to cover the bricks with paper, burlap or straw, or to dampen them occasionally. Don't discard cracked bricks. They can be used to bond succeeding courses of the walls.

When the bricks are dry enough to hold their shape (usually one to three days after molding, depending on the climate), stand them on edge at once and remove the burlap or paper. If the paper or burlap is allowed to remain until the bottom of the brick is dry, only hard scraping will remove it. When standing the bricks on edge, place them near one another at right angles so that if one falls it will be supported by another. When the bricks appear dry, they may be stacked in loose piles. It takes from one to two weeks for bricks to cure thoroughly, depending on the climate and on the wetness of the soil material when molded. Rain will not harm the bricks when they are drying if asphaltic emulsion was used. All of the asphaltic stabilized bricks for a large building recently built in Los Angeles were successfully made in the rainy season of January, February and March.

### *The Foundation*

While the bricks are drying, the foundation and footing can be constructed. Monolithic concrete foundation footing should be made of a width one and one-half to twice the thickness of the adobe brick walls. This footing should be carried below

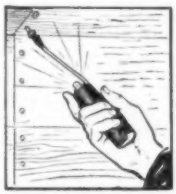
[*Continued on page* 148]

# NEW PRODUCTS

Windshield visibility and wiper invisibility are the basis of a recently issued patent. Instead of using conventional reciprocating wiper blades, the inventor mounts a number of blades on a shaft above the windshield. The blades are driven in a single direction by a motor at such a high velocity that they are invisible to the driver of the car. The high speed of rotation is claimed to remove sleet and snow from the windshield at a rate fast enough to prevent settling and freezing.

* * *

A new invention relates to a screw driver provided with a light so arranged that the light rays reach the tip of the screw driver with a minimum of shadow. The lamp is located in the tool handle, the bulb being prefocused as in recently introduced penlights. The shank of the screw driver is offset so that the light bulb is situated substantially directly in back of the driving tip.



* * *

Protection of the foot and ankle against crushing by heavy objects is provided by a patented rigid metal shell and shoe combination. The construction is such that should a heavy object drop on the foot, the strain of resistance to the impact is transmitted by the shell directly to the ground instead of through the foot to the ground.

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# Modern Houses Of Earth

[*Continued from page* 146]

the surface of the ground 1′ and should extend above the ground 6″ at least. The foundation above the ground need only be as wide as the adobe brick walls unless a sill is wanted to hold the ends of the floor joists. On filled ground or any other loose subgrade, the concrete foundation footing must be reinforced with steel bars. The top 6″ of the concrete foundation should be made waterproof by adding asphaltic emulsion to the concrete mixture in the proportion of two gallons to each sack of cement. Mortar keys, ½″ x 6″ x6″ spaced on 1′-centers, should be cast in the top of the foundation wall. Before laying bricks, the mortar keys and the top of the foundation walls should be cleaned of all loose dirt and then wet to insure a strong bond with the brick mortar. If a waterproof concrete foundation was not made, a thick coating of asphalt should be spread over the top surface of the concrete foundation. Bricks should be cleaned of all paper, loose sand, dust or any other foreign matter and should be wetted before laying in the walls.

### *Laying the Bricks*

The mortar for laying the bricks may, if desired, be of the same material as the bricks. Bricks can be laid faster, however, without the danger of the walls settling, if a mortar is used made of one part of cement to two and one-half parts of concrete sand mixed with two gallons of emulsified asphalt to each sack of cement. If this cement mortar is not used, not more than four courses of bricks should be carried around the entire perimeter of the walls at a time. By the time one revolution is completed, the mortar joints should be dry if drying conditions are good, and another course of bricks may be laid. Another course must not be started until the mortar in the last one is dry. Only by observing this rule can walls be laid true and lintels be prevented from settling harmfully.

The mortar should be spread 1″ thick on top of the foundation wall to fill the mortar keys and thoroughly bed the first course of bricks. The bricks should then be laid so that each course overlaps to the center of the bricks in the course below. For the simplest laying, each brick course should be started at the corners and wall openings where the special one-half size bricks are used in every other course. Any other necessary irregular length bricks can be put in the intervening space between the wall openings and corners to avoid weakening the bond. The mortar joints should not be less than ½″ thick. All vertical and horizontal joints should be filled completely with mortar. Bricks can be laid in the walls faster than the time required to mold them. Two men can easily lay two hundred to three hundred and fifty bricks a day, depending on whether the mortar is mixed by machine or hand.

Where earthquakes are frequent, it is advisable to reinforce the adobe brick walls against lateral thrusts. They can be reinforced by laying 1″-steel mesh in the horizontal mortar joints every 2′ in the height of the wall. The mesh should be as wide as the wall and should be lapped 12″ at splices and lapped 10″ at corners and at junctures with interior walls. If this mesh is unobtainable, other things may be safely substituted. Two strands of two twisted wires, twelve gauge or heavier, can be laid in every sixth horizontal mortar joint. Three strands of barbed wire laid in every third or fourth mortar joint, or any woven wire fencing are good reinforcements. Any iron rods, such as old automobile brake rods, will also serve the purpose. Even rough wooden battens laid horizontally or vertically have proved efficient.

The frames for window and door openings are put into place as the walls are laid so they can be securely fastened in the mortar joints. The frames can be temporarily braced with other lumber to prevent warping of walls at the doors and windows. The wooden or concrete lintels should also be laid in place above the wall openings when the brick wall has risen to their height. Any interior walls of wood studding should be anchored to the adobe brick walls with metal strap anchors, with the ends hooked and embedded in the mortar joints between courses of bricks. Floor plates and door sills of wood should be bedded in mortar and anchored with bolts set in the concrete foundation.

### *The Roof*

On top of the brick wall, bolt the wooden plate or lay the reinforced concrete cap as previously explained. Then the roof can be installed in the usual way.

Roofs have been successfully covered with asphaltic stabilized adobe for shingles. The stabilized adobe can be molded into tapered 1″ shingles with two holes for nailing under the overlap, or the stabilized adobe may be trowled directly in place on the roof in a 1″ layer. Wire mesh is used to anchor the adobe on the roof structure if the latter method is used. Even Spanish type semi-cylindrical tiles have been molded from stabilized adobe and successfully used on roofs. The success of any stabilized adobe roof depends on the sturdiness of the roof structure. Because of the great weight of these roofs, the supporting rafters should be strong enough to prevent the roof sagging. For if the roof sags, the adobe is likely to crack, causing the roof to leak. When properly trussed and braced, 2″ x 6″ roof rafters spaced 16″ on centers and not spanned more than 17′ should safely support an adobe roof. A house in Los Angeles with such a roof has withstood heavy rains and several minor earthquakes without damage.

No matter what type of roof you build, it should be well insulated. It is economical to use a roofing material having insulating qualities. A roof that is not insulated squanders the excellent insulation

[*Continued on page* 150]

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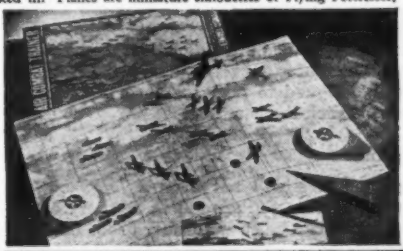

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[*Continued from page* 148]

provided by the thick adobe walls. It should also be fireproof, for then your entire house will be fireproof. The adobe roof described is, of course, both fireproof and insulating A roof having the same advantages can be made from lightweight concrete, the ingredients for which can be purchased almost anywhere. This roof, although much lighter than an adobe roof, is installed on wire netting. The roof rafters should be well braced and the roof designed to bear the load, for a sag or sway will crack the concrete.

### *The Floor*

If your house will not have a basement, the floors can rest on the ground. A subfloor of stabilized adobe can be economically used. The earth is first leveled, then watered, tampred and dried to prevent any future settling. At least 4" of sand should be spread on the ground. Lay the stabilized adobe bricks on the sand, filling the mortar joints with the same dry kind of cement mortar used in the walls. The regular flooring can be laid over these bricks. Another way is to pour 3" or 4" of stabilized adobe material on the sand and smooth with a trowel. Wooden sleepers can be laid for nailing hardwood flooring, and the space between the sleepers filled with enough adobe material to make it level. If wood flooring is not desired, tile or dry concrete, linoleum, etc., can be laid on top of the adobe subfloor after it is dry.

All water and gas pipes to be installed under the floor should be tested for correct installation before the subfloor is laid. The best way to handle these pipes when there is no basement is to bring them from the attic down the walls into the rooms. A small chase or groove deep enough to hold the pipes is cut in the walls. After the pipes have been tested, they are covered with the same kind of material used to make the bricks. The mortar should be pointed and troweled to match the outline of the bricks unless the walls are to be plastered. The electrical wiring can be installed in the same way. Small size conduits can be laid horizontally between the courses of the bricks in the mortar joints.

No chases or grooves more than 1" deep should be cut in walls of mimimum thickness.

Openings for heating can be made in the walls when the furnace is not installed in a basement. The heating ducts can also enter the rooms from the attic. When a basement furnace is used, the heating installation can be made in the usual way. Fireplaces and chimneys can be built in the same manner as in the rammed earth construction.

### *Finishing the Walls*

The stabilized adobe walls can be finished in several ways. If the natural coloring of the soils is pleasing, the exterior walls can be left unpainted, or the walls may be plastered with the same material used in the stabilized bricks to cover the outline of the bricks. If the bricks are not stabilized with asphaltic emulsion when made, then it is necessary to apply frequently to the exterior walls a waterproof coating of oil, tar or waterproof cement. Painted adobe brick walls, either exterior or interior, have an attractive texture. Interior walls may also be wall papered. Mud plaster is applied to the walls the same as cement and lime plaster. Usually the mud plaster will adhere more closely than these standard plasters for its expansion coefficients are about the same.

In mixing the soil material for plastering, the soil should first be screened to remove small gravel, which will tear the plaster under the trowel. If the soil is a clay or clayish loam, screened sand must be mixed with it to prevent cracks in the mud plaster when drying. The amount of sand needed can be determined only by experiment. Three coats of a good grade of lead and oil paint will make an attractive mud plastered wall. The ceilings can be finished with mud plaster, also.

Another method of painting is first to rub the walls with a wire brush or wet burlap, and then to wash them to remove the dust. A prime wash coat made by mixing to a creamy mixture one sack of white cement and about six gallons of water, should be put on the walls while their surface is damp. The cement wash coat should then be wetted several times daily for five or six days, if necessary, until the cement coating is hard. The cement wash may be colored with pigments, or the cement-primed wall surface may be painted with oil paints.

If standard plasters are to be used on the interior walls, the walls must first be covered with metal lath, or 1" eighteen gauge galvanized chicken wire must be fastened to the walls by concrete furring nails or staples driven into the bricks. Otherwise, the plaster will not adhere to the walls.

Whitewash and cold water paints can be simply applied to the walls but these paint coatings, if used on the exterior walls, must be renewed after seasonal rains.

Canvas makes a very attractive and suitable finish for interior walls. Its texture harmonizes with adobe and the strength of the canvas resists cracking and wear. The canvas is hung the same way as wall paper after the walls have been plastered smooth.

The adobe brick walls can also be enameled to appear like glazed tile in rooms where this would be appropriate, such as kitchens and bathrooms.

Stabilized adobe has many other uses. Bricks 6"x12"4" are appropriate for garden walls. Stabil-

[*Continued on page* 152]

## Our War Machines Meet Test

[*Continued from page 54*]

than the enemy's. In the fighter field, the P-39 and P-40 used here are good for specialized low-level work, but our pilots are at a disadvantage as a whole in working against not only the Focke-Wulf 190 but also the Messerschmitt 109. Our fighters are greener than the enemy's, although equally courageous.

Although there is grumbling back here, the performance of our soldiers at the front is excellent. They are nervous the first time that they are in action, and what shell-shock cases are going to develop, appear then. But afterward the soldiers get angry and want to strike back. Offensive spirit and teamwork appear almost at once and develop rapidly. The Americans learn that the noises of battle are disconcerting, but that they have superior fire-power and, if they use it properly, have a margin of safety, although no one can make things utterly safe anywhere in a battle area.

Our generals and higher officers are as good as or better than any that the Germans have—poorer generals are quickly superseded. It is my observation, however, that the lower officers—lieutenants and captains—are likely not to be so well trained or schooled as might be desirable.

Changes in tables of organization might well be made on the basis of our experience here. Unlike the British, we have too few men for some service duties, like communication, and too many for others. In using what he has available the enemy has been far ahead of us, as is natural, in view of his years of practical experience. Although our troops in this theater have learned from him "the hard way" and made improvements of their own in techniques, we still have much to do in emphasizing this matter of co-ordination, which, experience proves, is of prime importance in modern warfare.

---

When sandbags must be made rotproof, emulsions of tar oil and metallic soaps can be used.

---

A slightly altered version of an ordinary tailor's pants-presser is "baking" plywood airplane wings to proper contour at one aircraft factory.

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Female cottontail rabbits average heavier than males.


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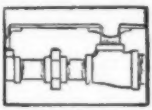
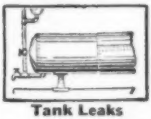


(Pipe Leaks



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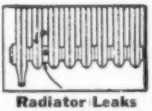

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## Modern Houses Of Earth

[*Continued from page* 150]

ized adobe can be molded into stepping stones for use outdoors. A tennis or badminton court paved with stabilized adobe is very satisfactory. The floor of the garage can consist of stabilized adobe laid in the same way as for subfloors. When painted it is very attractive and is easily cleaned.

This concludes the series on Modern Houses of Earth. The three previous issues of MECHANIX ILLUSTRATED have covered soil preparation and rammed earth construction. Either house, the rammed earth or adobe brick, will provide you with an attractive, durable dwelling, and even your great-grandchildren will be proud of their home you made of the good earth.

### QUESTION BOX

Here are the questions on Aviation Lesson 5. They are the same type as those included in certain C.A.A. examinations. Don't be satisfied with getting a few of them correct. Study the text until you can answer all of them. They're very important to everyone who flies.

1—What are Airspace Reservations and by whom are they designated?
2—What are Civil Airways and by whom are they designated?
3—How wide is a Civil Airway?
4—How are Civil Airways named?
5—What is a control zone? What is its area?
6—What is a control zone of intersection? What is its area?
7—What is a control airport?
8—What is a radio range station?
9—How do control tower operators direct air traffic?
10—What is a control area?

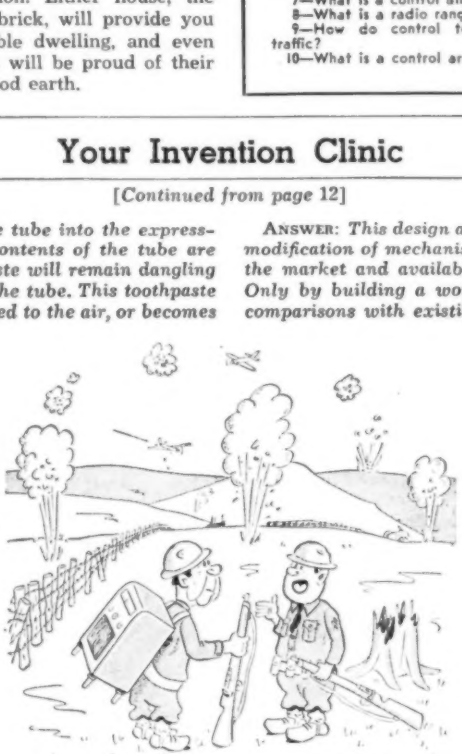
## Your Invention Clinic

[*Continued from page* 12]

***must insert the top of the tube into the expressing mechanism. As the contents of the tube are expressed some of the paste will remain dangling from the open mouth of the tube. This toothpaste hardens where it is exposed to the air, or becomes dusty and insanitary-looking.***

***Assuming that the expressing mechanism could squeeze out the entire contents of the tube (which is doubtful in this design) it then becomes necessary to remove the old tube. This can be done only with difficulty, no provisions having been made for a speedy release.***

***Though we admit that your design is simple we do not think that it will do the work. If you and other inventors who are working upon such a toothpaste dispensing device will bear in mind the objections to this design and produce a unit which can overcome all of the enumerated drawbacks then, and then only, will you have what we consider to be a marketable invention for your purpose.***



"When I said to carry your radio with you, I was referring to the walkie-talkie!"

### Pea Sheller

Hale E. Johnson, Klamath Falls, Ore., has submitted a design for an automatic huller for peas and beans and he asks for our advice.

ANSWER: *This design appears to be only a minor modification of mechanisms which are already on the market and available for the same purpose. Only by building a working model and making comparisons with existing devices would you be in a position to determine whether your pea and bean sheller is superior to other manufactured items.*

*It may be that you will get greater speed of operation. If so, the extra cost of construction might be justifiable. Unless these tests are made, however, we would advise against further action.*

### Truss

H. Kenneth Whitney, Niagara Falls, N. Y., has designed a plastic rupture truss and although he "has contacted 50 manufacturers" he has so far been unable to market the item. He would like our advice.

ANSWER: *In our opinion there are several things wrong with this truss from the standpoint of its commercial production. We do not question that the truss has proved beneficial but it will not be serviceable in every type of hernia. It cannot be marketed successfully unless it could be made from a plastic material which can be molded easily by the wearer and which will harden to the desired shape.*

## Your Invention Clinic

*Our recommendation would be that you try to develop some suitable substitute material which could be handled easily by the purchaser. Then you might be in a better position to establish a market for the item.*

### Musical Toy—Pipe Filler—Combination Mouth Sprayer

Lemuel Gilmore, St. Louis, Mo., sends a drawing of a musical toy for infants, a plastic pipe filler and a combination mouth sprayer.

ANSWER: *Of the three ideas submitted, only one impresses us favorably; namely, the musical rattle. Even here there is a mechanical objection in that the rattle functions only when the movement is in one direction and a movement at right angles is likely to damage the tone-producing devices.*

*By the use of a guide it would be possible to translate most movements of the rattle to a sound producing operation. Also, by modifying the positions of the tone-producing units the musical sounds could be produced regardless of the manner in which the rattle is handled. This may entail an increased cost in manufacture and also would seem to create another modification which should be protected. We would recommend that you have a search made on this device and also on its modification. Any further action would depend upon the outcome of that search.*

*We do not think that the funnel for filling a pipe is suitable because pipes are available in all sizes; therefore, one funnel would not fit every bowl. Also, there is not enough room available to furnish this funnel with each can of tobacco. The cost of too many useless funnels would have to be borne by the manufacturer or the purchaser.*

*We do not think that the public can be educated easily to the use of the combination mouth sprayer. Such a unit would necessitate an extensive advertising campaign and increase the cost of the product far beyond its assumed value. We would advise against any action on this unit.*

### Four Wheel Drive

Frank Stebbins, Mountain Lake, Minn., states that he has been allowed a patent on a four wheel drive for autos which eliminates the differential.

ANSWER: *Without an examination of your patent drawings we have no way of knowing what sort of a mechanism you have developed. All readers of these pages should know that an opinion can only be expressed upon such details as inventors care to submit. If these details are not forthcoming, generalities only can be given. To wit:*

*Many four wheel drives have been designed which require no differential. Some of these are hydraulic, some are electrical and others are mechanical. Your unit may be better than most. On the other hand, it may be too complicated.*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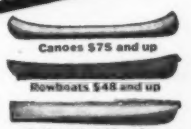


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## Death On Subs

[*Continued from page* 38]

strangulation, and breaking all the compressed air connections. The elbows of air and water lines are especially vulnerable and fragile. The stern glands of the propeller shafts may be fractured, causing leaks which cannot be stopped. And perhaps most serious of all, the batteries without which the submarine cannot move under sea can be torn loose from their foundations, releasing sulphuric acid which, when coming in contact with sea water, forms poisonous chlorine gas.

We guess at these things, though we cannot be sure of them. Only when the bodies of a stricken sub's crew float to the surface are we positive that the sub has been done in. But we throw over a buoy to mark the spot. It is a probable.

On through the night PC— dashes hither and yon on her mission of protecting the convoy of huge ships by whose sides she looks like a seagoing terrier. In the morning at chow we discuss the events of the night before, speculating on the probability of our success.

Another day and the same routine. It's always the same routine. To vary it and to keep in constant practice we have drills during the day. We put over a large target and practice marksmanship with the three-inch guns. Or we throw out the small arms target and pepper it with shot from the tommy guns and the .45s.

To be ready for every emergency we have man overboard and collision drills. We practice abandoning ship and brush up on our signaling. And then we have more gunnery practice and loading drills.

When off duty we study navigation problems or play games like cribbage and the old navy standby, acey-deucey. Sometimes on a quiet evening the crew will gather below decks and have a bull session. Some of the boys have musical instruments aboard and they drag them out for these happy occasions.

All through the day and night the officers and men of the watch are at their posts, always alert, always ready. Always PC— is speeding in and around through the convoy, dashing this way and that, around the flanks, ahead and behind, searching, searching, searching for the lurking, hidden enemy.

Perhaps it gets a little dull at times—till suddenly the sub detector in the pilot house begins to squeak. Ears prick up, nerves tense. Those in the pilot house crowd around the machine, studying it closely. Contact?

"All engines ahead standard."

PC— picks up her nose like a startled terrier. She springs to the chase, shaking with excited tremor as she gathers speed. She darts through the spray, twisting and turning as she makes for her target. The sub detector is still whining its fevered alarm, but as PC— comes closer to the area indicated the machine returns to its normal subdued squeak.

False alarm. It's routine, but a vitally necessary

## Death On Subs

routine. No chance must be lost to detect the presence of our enemy. Better a hundred false alarms than to miss one submarine. The men return to their regular duties or go below to rest—till another alarm sounds.

It may be a speeding torpedo or a periscope peeping out from the surface of the sea. A periscope is hard to detect in the feather-tipped foam of rushing whitecaps. It takes sharp eyes and quick thinking, but our men have been trained to a sharp edge. They are always alert, never relaxing their vigilance. One slight deviation from sharp attention to duty may mean great damage to our convoy—and perhaps death to ourselves.

So we sail the sea attending to our business. After several days we near the end of our patrol, where ships of another sea frontier will take over. We signal good-by and good luck to the merchant vessels and enter the base at the end of our run. We secure the ship and tie up at the pier.

We go ashore to stretch our sea legs and get the feel of land again. We get a little rest and recreation and then, after a few days, the Captain is summoned to a Convoy Conference. It means we are going out to sea again. Back to the old familiar routine.

---

Nazi-Holland announces a new ersatz shoe, of reed, wicker or rush, in "several elegant models."

---

All the bombs dropped on London in the last war could be carried in one flight by seven of today's heavy bombers.

---

Slow-moving "pedestrians" of the sea, certain types of sharks have been known to be impaled on the prows of ocean vessels.

---

More trapping of rabbits is urged by the government not only to protect farm crops but to supply felt for hat manufacturers.

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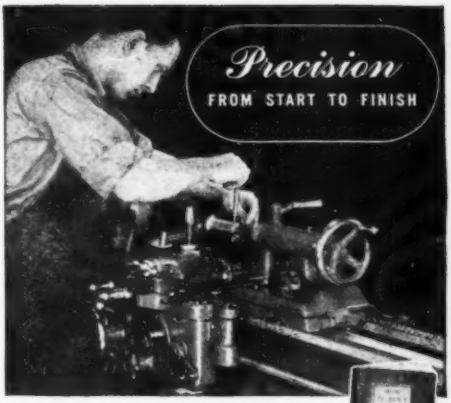
Tires on civilian cars are wearing out eight times faster than they are being replaced, meaning that practically all cars will be off the road by 1944.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# What Is An Officer?

[*Continued from page 57*]

between the uncomplaining sick man and the querulous shirker in order to get proper medical care for the former and to confound the latter. Above all, he must know food and its proper preparation and know what his men are eating at every meal every day. In addition he must be a physical culture expert, keeping himself and his men hard and fit by proper exercise and sports. If he has been a high school athlete the experience will stand him in good stead.

He must also be a good administrator, knowing the reports and returns, the preparation of pay and muster rolls and the paperwork involving the proper accounting, pay, clothing provisioning and munitioning of his men. He will be called upon to be somewhat of a lawyer, knowing military law, the Articles of War, and the procedure of summary, special and general courts-martial. He may be called upon at any time to act as judge, jury and prosecutor in the first named or to be a member or counsel for the defense in the last two. But these are only a small part of his duties.

He will be wiser if he avoids the necessity of having his men appear before courts-martial. This requires a high standard of discipline and esprit de corps, which he must seek to inculcate in his men. If he is a natural leader, if he was captain of his football or baseball team in high school or college, or an organizer of school activities, he will have little difficulty in instilling the right spirit in his unit.

One of the many means of accomplishing this is to secure a high degree of technical proficiency in the men in the handling of their weapons. In order to achieve this, our lieutenant should be able to handle effectively every weapon that his men employ, the ideal being to be a better shot with rifle, automatic rifle, machine gun, trench mortar or other weapon than any man in the outfit. In addition he should be an ordnance and ballistics expert, knowing every part of every weapon and being quickly able to take down and assemble it, and knowing the factors of range, humidity, heat and windage in the actual firing.

To combine the differing capabilities of the different men into compact combat weapon teams, he will have to be something of an organizer and personnel manager, encouraging the backward to come up to average, maintaining the fine edge of the average and promoting and using the services of the above average men as non commissioned officers. Upon the skill with which he does this will depend the combat efficiency of his unit as a whole. In addition he must also be a good transport expert, able to diagnose and prevent breakdowns in motorcycles, jeeps, trucks, half-tracks, scout cars or whatever transport his unit uses.

The foregoing is an incomplete summary of the duties of a combat officer while in the troop training period. It can be seen that any one of these subjects could absorb immense amounts of time in study and practice. But this is only the beginning.

The young officer has also to be proficient in getting his men to the fighting zone. He must guard their health and well-being on the transport going over seas. Upon arrival he must protect them against the strange foods, drinks and diseases of foreign ports, see that they understand the customs and habits of native populations, and endeavor to keep them on friendly and harmonious terms with allied troops, in which role the officer will have to be something of a diplomat. If he speaks a foreign language, French, German or Japanese, so much the better as his knowledge can be of invaluable service to his unit.

Once on the march toward the fighting front, the officer, of whatever combat branch, must be somewhat of an engineer. Castramentation, the laying out and maintenance of camps and bivouacs we have already touched upon. In addition, the officer should be a good topographical engineer, understanding not only the reading of maps but the making of topographical sketches if need be. In this he will find that his studies of geometry will be of practical aid. If he has ever done any surveying it will be of enormous benefit. Another important part of his engineer's duties will be camouflage, the protection of his men and vehicles from observation and aerial or artillery attack from enemy forces. The elements of bridge construction should be part of his knowledge, especially the ability to throw up single or double lock emergency spar bridges, for crossing deep gullies or narrow streams that impede his march.

Our Lieutenant Jones should also understand the elements of hasty field fortification, the proper construction of foxholes, trenches, the use of revetting materials, barbwire, tank obstacles and the removal of enemy land mines and laying of land mines for the protection of his own unit. He must have a military engineer's eye for terrain, knowing the difference between the real crest and the military crest of hills, the most effective slope gradients and the most effective positions to take in the event of sudden enemy attacks on the march.

In addition to engineer knowledge, his technique should include signals, the establishment, maintenance, repair and use of radio, field telephones and the use of visual signaling aids.

It is in the oftimes grueling conditions of the march that an officer's abilities as a leader are most rigorously tested. If he can be cheerful under conditions of rain, snow, dust or heat, if he can maintain his serenity under conditions of fatigue, hunger and discouragement, his men will quickly reflect his spirit and be 100 per cent more effective than an outfit whose moroseness is deepened rather than relieved by their officers. The officer who will refuse warmer or more comfort-

## What Is An Officer?

able billets than his men have, who will eat the same food and stand the same hardships that the soldiers undergo, will find that it will repay him in the crucial test of battle.

For now we come to the culmination of all these labors and studies, the actual fighting ability of our Lieutenant Jones and his combat team. Whether his group of men will be wiped out in the first blast of withering enemy fire or the first smashing aerial or tank attack is almost entirely dependent upon the manner in which our Johnny Jones has learned his job as a combat officer. He is now the man to whom all of his soldiers look trustfully and hopefully, as the guy who knows the answers. Upon his quick grasp of terrain and of weapon disposition and use of cover, depends the difference between life and death, defeat or victory. As part of a larger unit the officer must maintain communications, not only to the rear but to the units on his right and left. He must transmit knowledge of the enemy movements on his front or flanks. He must look after the security of his own position and know the obstacles between that position and the enemy position he is called upon to seize. He must forget all considerations of his own danger in maintaining a serene and confident bearing before his men, even when things look their blackest. In fixed positions he must be alert day and night to prevent surprise attack. In detached operations, operating on his own, he must intensify security for his front, rear and flanks. He must keep constantly in mind the character of the terrain in his front and rear, the latter in case he should be forced to fall back. Above all he must know the capabilities and limitations of other branches and be able to cooperate most effectively with neighboring artillery, infantry, tanks or tank destroyer units as well as aviation.

In addition to knowing every detail of his own unit's handling, he must acquaint himself with the duties of the commander of the next higher unit, so that if called upon in the heat of battle to take over a company or battalion group rendered leaderless, he shall not be found wanting.

Lest the young officer be worried by the seemingly complicated requirements of battle tactics, let him remember what our own Nathaniel Bedford Forrest, that skilled cavalry commander in the Civil War has to say about tactics. Said General Forrest, "The essence of tactics is to get there first with the most men," and, "I'd give more for five minutes of bulge [jump] on the enemy, than for all the books on tactics in the world." Let the young officer or the young man aspiring to be an officer, remember that 95 per cent of war is in the training and preparation and only some 5 per cent in actual battle. If the training and preparation are thorough enough, the battle will take care of itself.

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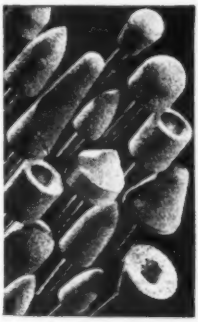
Brazil has more than three billion coffee trees.

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# Your Post-War Boat

[*Continued from page* 132]

having few railroads, hard surfaced roads, docking or other port facilities. The system will employ truck- and trailer-carrying landing boats, similar to the tank barges used by the Army in the occupation of North Africa. This idea will open huge new areas, hitherto difficult of access, to world trade, and help bring isolated portions of the post-war family of nations closer together.

Another step in this general direction will be Higgins' high speed, double-hulled passenger boats. These boats, built like huge catamarans, will carry 125 passengers at 40 m.p.h. and operate at a lower cost per passenger than motor buses or diesel passenger boats. Like the amphibian freight, the catamarans will operate in countries where good transportation is lacking.

Two famous American yacht designers and naval architects who favored us with their post-war views at some length are John G. Hanna and Howard I. Chapelle. These two men have contributed a great deal to the advance of modern small boat design (many of you will recall Mr. Hanna's trans-ocean ketch Tahiti, whose plans appeared in How To Build 20 Boats) and are as qualified to predict the future of the maritime world as any men alive.

First let's hear from Jack Hanna: "The day of the super-colossal passenger liner is gone. Such monsters as the Normandie were always unprofitable to operate, and from now on the cream of the passenger trade will go by air. However, there will always be plenty of passenger liners of good size and luxurious appointments, because many people go to sea not to get across in a hurry, but to enjoy the rest of a long voyage. And there will always be vast fleets of cargo ships, because water transport is and always will be by far the cheapest form of transport per ton-mile attainable.

No doubt there will be vast fleets of cargo planes, but so many millions of tons of goods are exchanged in international commerce that all the planes that can find landing space around our great cities will make no appreciable difference in water tonnage.

"In the yachting field the day of the baby liners our millionaires once played with are ended, at least for a generation to come, for the reason that war taxation will leave no incomes big enough to support them. But I expect a large increase in yachts of a size that can be handled by the owner and his family or friends.

"In materials, of course, we shall see more use of plywood. But buyers may well exercise a little caution here. We have had ample pre-war experience to prove that, while it is the finest material imaginable for certain boat uses, it is by no means the cure-all for every boating ill.

"Plastics will make their appearance in many places on boats—and presently their disappearance from not a few. For this material also, marvelous as it is, is distinctly not the perfect substitute for everything."

"Chap" has this to say: "I have no patience whatever with designers who are so impressed with the fad for 'streamlining' that they visualize fully streamlined ships traveling at terrific speed. Such ships are uneconomic and impractical. The first because high speed is uneconomic, the second because all of the streamlined ships I have seen planned sacrifice deck space, which is actually of far greater importance than these designers think. Deck space is used for passengers, freight and for the crew to handle the ship at sea and in docking. It cannot be sacrificed for 'streamlining.'

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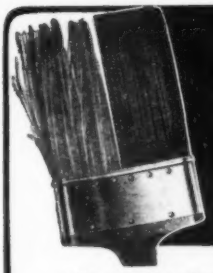
are neither practical nor desirable except in very limited trades, such as the fruit trade, for example. There is no known way of making a really fast ship cheap to run and if taxes are as high after the war as we think they will be it is plain that cost of operation will be a very important matter.

"I hope that, after the war, the importance of the so-called 'inland waterway' transportation will be appreciated. At present, we have the necessary knowledge to produce freighters that can be operated at very low cost and that will compare favorably in delivery speed with most forms of land transportation of heavy freight. The trouble is a lack of public interest and legal drawbacks. While it is possible to operate an inland waterway freighter with a very small crew, laws prevent this if the freighter is over 65 feet long. In short, because of obsolete laws and lack of interest, we cannot put to use the advances in methods of design, construction and operation that we already know.

"In pleasure boating I would expect the greatest use of modern materials and techniques. If such craft are in demand it is obvious that there will be an increased use in plastics and light weight construction as well as the employment of lightweight motors. I think we will see an increased use of outboard motors, in any case, as the war has greatly improved this class of popular propulsion.

"I look forward to seeing a lot greater amateur interest in the construction and design of pleasure and small commercial boats. It is likely that the public for boating will be far greater than before the war."

Mr. Chapelle's reference to an increase in amateur boat building after the war is no idle remark. There'll be a lot of us who, for one reason or another are going to build our post-war boat instead of buying it. We've got our backyards all ready and we're just waiting for the last gun to fire and the new materials to come rolling out of the factories. But whether our boat is home built or factory built is immaterial. The important thing is that it's going to symbolize the new era in boating that will come when peace comes.

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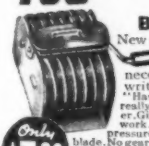

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# Hell 'Round The Clock

[*Continued from page* 69]

As opposed to the British theory of "saturation" bombing, Americans have developed their theory of "precision" bombing. American bombardiers claim to be able to "drop a bomb in a barrel from 25,000 feet"—and there seems to be little doubt about their ability to carry out this boast. Secret of precision bombing is the highly "hush-hush" American bombsight, which the U.S.A.A.F. has not released even to the British (although the British have been given an earlier and less accurate type of sight). Second secret of American success at daylight precision bombing is the heavy armament carried by Fortresses and Liberators. Heavy .50 caliber machine guns and cannon enable the U.S. bombers to slug it out with daytime fighter planes. In order to carry such a weight of armament, the U.S. bombers must sacrifice a portion of their bomb load.

Since precision bombing depends upon good weather for its success, it has been claimed that American bombers could never operate successfully over Northern Europe in the frequent heavy ground fogs and rains of that part of the world. A bombsight, no matter how excellent it is, is worthless unless the bombardier can see his target. The success of American operations to date belies this argument to some extent. However, it is true that American bombers have been converted and altered somewhat for operations in the Northern European theater, and Fortresses and Liberators in England now carry a heavier bomb load and go in for a combination of "saturation" and "precision" bombing in the daytime.

Actually, there is no argument between American and English authorities about the relative value of "saturation" and "precision" bombing. The fact of the matter is that the two types of bombing complement each other and are now enabling Marshal Harris and General Eaker to give the Nazis "hell 'round the clock."

Experts had declared that 1,000-plane raids were impracticable for two reasons. They feared that if the enemy got wind of the arrival of such a large bomber force, he could knock it to pieces with clouds of fighters. They argued that the traffic problem—the co-ordination of such an attack—was insoluble.

Air Marshal Harris overcame both these very real difficulties. The bomber armadas are accompanied by a strong fighter escort—200 to 300 night fighters. These carry out "intrusion" attacks on the German interceptor and fighter airports along the route taken by the bombers. The traffic problem has been solved by minute planning—a miracle of split second timing. The bombers take off from a great chain of fields stretching almost continuously from London to Edinburgh, a squadron or two from each field. A lane through the skies is charted for every individual plane, and the time at which each bomber must reach its target is calculated with stop-watch precision. These great raids are mapped out on paper to the last detail, far in advance.

The huge personnel requirements of "saturation" raids have also been met. Seven thousand crack pilots and crewmen and a highly skilled ground staff of about 120,000 men are needed to put a force of 1,000 four-engined bombers into the air. The R.A.F. now has them.

Only one obstacle is still preventing the allies from hurling 1,000 planes against the Nazis every single night: they are not yet rolling out enough heavy night bombers. Even if combat losses are kept down to 4 per cent, daily 1,000-plane raids would mean a monthly loss of 1,200 bombers. And this is less than half of total operational losses, which include losses from accidents, damage, and wear-and-tear. Altogether about 100 replacements are required for every 1,000 bombers sent out—a monthly total of 3,000. When allied production matches up to that figure—and Major General Eaker has announced that U.S. bomber strength in Britain will soon be on a par with the R.A.F.'s—Hitler's Germany will be systematically reduced to ashes, city by city.

### 24 HOURS IN THE LOG BOOK OF THE ALLIED AIR OFFENSIVE

**THURSDAY NIGHT:**

Shortly after midnight heavy "saturation" raid on Nuremberg by R.A.F. bombers. Targets: war factories, manufacturing plant making tanks, armored cars, and Diesel engines, Faun Motor Works, Siemens Schubert Electrical Works, railway junctions, etc. Object: to destroy enemy's war potential. Also part of the process of "softening up" Germany. Losses: 9 bombers.

Targets in Western Germany also attacked by R.A.F. bombers.

**FRIDAY NIGHT:**

U. S. Four-engined bombers in daylight raid on Wilhelmshaven. Targets: dock and submarine building yards. Object: to hamper U-boat warfare. Losses: 7 bombers.

R.A.F. and American Ventura bombers escorted by fighters raided Dunkirk. Target: docks. Object: to destory Germany's coastal shipping and thus to disrupt communications.

**FRIDAY AFTERNOON:**

Two more raids by American Venturas. Same target and object. Loss: 2 bombers and 2 fighters.

**FRIDAY EVENING:**

R.A.F. Whirlwinds escorted by Spitfires bombed an enemy airfield in the Cherbourg peninsula. Target: dispersal areas. Object: to wear down the Luftwaffe. Losses: nil.

R.A.F. Mosquitos bombed Rennes. Target: German naval storage depot. Object: to hamper U-boat warfare. Losses: nil.

**FRIDAY NIGHT:**

Very heavy "saturation" raid on Cologne, capital of the Rhineland and third largest city in Germany. Target: war factories and communications: Object: same as Nuremberg raid. Losses: 10 bombers.

In the meanwhile, the allied air offensive has already achieved impressive results. While "softening up" the Reich for the final blow, it has also played an important role in the battle of Russia. Half of Germany's fighter strength has been engaged in the West, and Nazi losses have been very high. A shortage of searchlights and anti-aircraft batteries was being felt on the Eastern Front as early as November, 1941. Moreover, 1,000,000 artillery men are tied down to manning ground defenses, and the Reich's acute labor shortage has been further aggravated by the necessity of recruiting a huge army of A.R.P. workers.

The list of German cities blitzed more heavily than London covers virtually every major strategic center in the Reich. Cologne—third largest city in Germany—is in about the same condition as was San Francisco just after the great fire. Nearly one-fifth of Bremen has been devastated, the freight yards burned out, and part of the Focke-Wulf aviation plant demolished. About 60 per cent of the port of Emden has been wiped out, including the important Nordee submarine works. Half of Duesseldorf has been gutted by incendiaries. 300 acres of Rostock and 300 acres of Luebeck have been reduced to rubble (as compared with 120 acres of London destroyed during the Blitz), and both these cities have been evacuated on a large scale. Virtually every town in the 450 square miles of the industrial Ruhr has taken a terrific pounding, and orders forbidding workers from moving show that morale is beginning to sag. Aerial photographs of a score of other key strategic centers, including the great ports of Kiel, Bremen, and Wilhelmshaven, reveal hundreds of acres of total devastation. This is the kind of punishment, which, in the words of U.S. Air Force chief General Arnold, the Nazis cannot "meet, defeat, or survive."

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# "1,000-Plane-A-Day" Harris

[*Continued from page 72*]

and elephants, trekked to and fro across the veldt in ox-drawn wagons. As a farmer in Rhodesia, young Harris cultivated a nice talent for bugle playing.

When the first World War broke out, he joined up as bugler of the 1st Rhodesian Regiment after foot-slogging it 450 miles across the Kalahari desert to the nearest recruiting station. He hobbled in foot-sore, sun-baked, and utterly exhausted. Being a man of quick and permanent decisions he made up his mind then and there that he would never walk anywhere again—and he never has. In town he drives his own car or takes a taxi to ride three blocks. But his favorite means of transport is the plane. When he was in command of the bomber group at Grantham, only a hundred miles from London, he always flew up to town. For years he has had his own plane, and invariably takes the controls himself. "Twenty-five years ago," he explains, "I made up my mind that if anyone is going to break my neck, it'll be me."

In the last war Harris fought through the whole of the successful campaign in German South West Africa. In 1915, he went home to England and was commissioned in the Royal Flying Corps. It was he who formed and commanded the first anti-Zeppelin night fighter group defending London. He also served tours of duty in France, and in 1918, won the Air Force Cross. His favorite sport was to make solo hedge-hopping flights, 30 feet above the ground, machine-gunning Boche troops or dropping the diminutive bombs used in those days.

It was probably the Harris belief in this daredevil type of flying, as well as the knowledge that at such low altitudes planes pass below the beam of radio locators, that prompted last year's spectacular raid on Augsburg, in which the great Diesel submarine engine plant was demolished. On this occasion, Lancaster heavy bombers hedge-hopped their way to their objective—wing tip to wing tip—more than 500 miles across the continent in broad daylight!

After the First World War, Harris remained in active serive with the R.A.F., commanded squadrons in Iraq, on the mountainous northwest Indian frontier, and in remote Kurdistan. All in all he has held command of eight different RAF squadrons at home and abroad.

In 1929 he completed a course at Army Staff College and for the next three years was Chief Air Staff Officer in the Middle Eastern Command, with a short interval in the Sudan. On a trip to Kenya, Harris adopted a lion cub which he named "Jackie," and brought up in the officer's mess. For some time wherever Harris flew, "Jackie"—a hefty youngster—went with him, to the alarm of his crew who felt that an almost fully grown lion was somewhat of a menace in the cramped space of a service plane. Eventually "Jackie" was flown to Cairo and presented to the late King Fuad of Egypt. His flying days were over, but he lived to a ripe old age in the Cairo zoo—a favorite with the public and the keepers.

In 1933 Harris was recalled to the Air Ministry in London, where he became deputy director of the vital Plans Department and Air Force Member of the Joint Committee of Imperial Defense. In this capacity he visited the United States in 1938 to order planes for the R.A.F. Impressed with the quality of Lockheed aircraft, Harris helped that firm go into mass production by placing a large order for Lockheed Hudson coastal-reconnaissance aircraft. These, and the North American Harvard trainers also picked by Harris, have played and are still playing a key role in the training and operational activities of the R.A.F.

On the Committee of Imperial Defense there was a constant and bitter tug-of-war between Harris and Admiral Tom Phillips, who represented the Navy, over the old controversy of plane versus battleship. When Phillips left for sea duty Harris warned him never to get out of range of a protective umbrella of airpower, "because if you do something will hit you with a bang. And," Harris cracked sorrowfully, "as you go sailing up to heaven your one and only reaction will be 'It must have been a mine!'" Admiral Phillips was in command of the Prince of Wales when, surprised without an air umbrella, it was sunk by Jap torpedo planes in the Gulf of Siam.

At the outbreak of war, Arthur Harris was placed in charge of Number 5 Bomber Group at Grantham, which was engaged in mine laying in the Baltic and in night bombing of Germany. A few months after Pearl Harbor he was sent back to the U. S., this time as head of the British Air Mission in Washington, with the vital assignment of co-ordinating British and American plane production.

Tough, efficient, outspoken, "Ginger" Harris scored an instant hit with U. S. military chiefs. His hotel room soon became a popular rendezvous where General "Hap" Arnold, Admiral Towers and other high-ranking officers would drop in after the day's work for a drink and a pow-wow.

In private life Harris is a jack-of-all trades and good at them all. A genial host in pre-war days, he could with equal skill whip up for his guests a *steak diable* or pilot them in his brother's yacht along the tricky Mediterranean coastline. Ships and sailing are his favorite hobby. A first-class navigator, he is equally proficient at mending sails, curing engine trouble, or just giving the ship a new coat of paint.

Referring to the co-operation between him and General Eaker, Harris remarked with a typical grin, "We co-operate so closely that he even kisses my wife when I'm away."

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